Rock Products

TRADEPRESS PUBLISHING CORPORATION
542 SOUTH DEARBORN STREET
CHICAGO

NATHAN C. ROCKWOOD, Editor CHAS. H. FULLER, Manager C. F. TREFZ, Associate Editor

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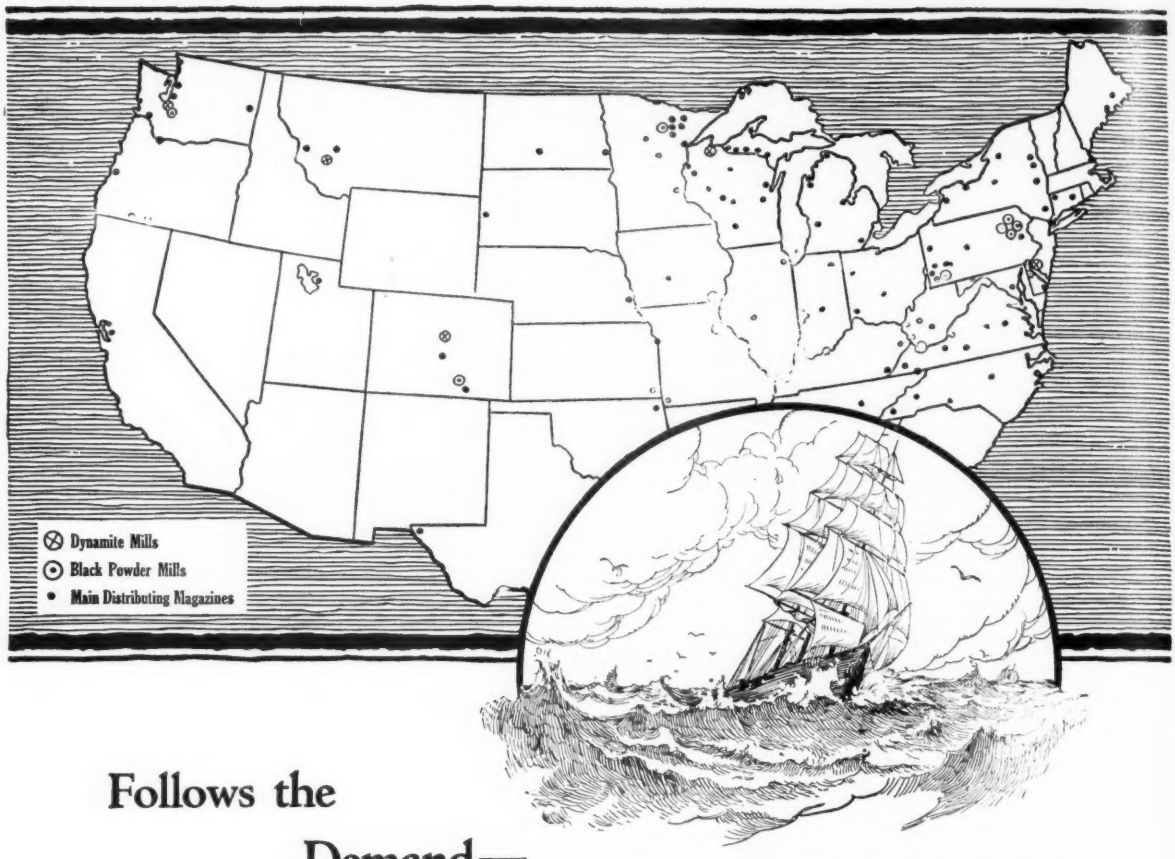

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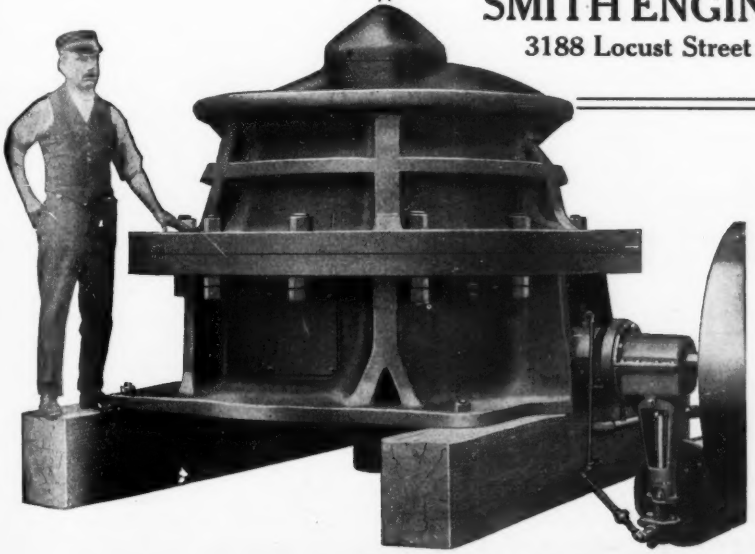

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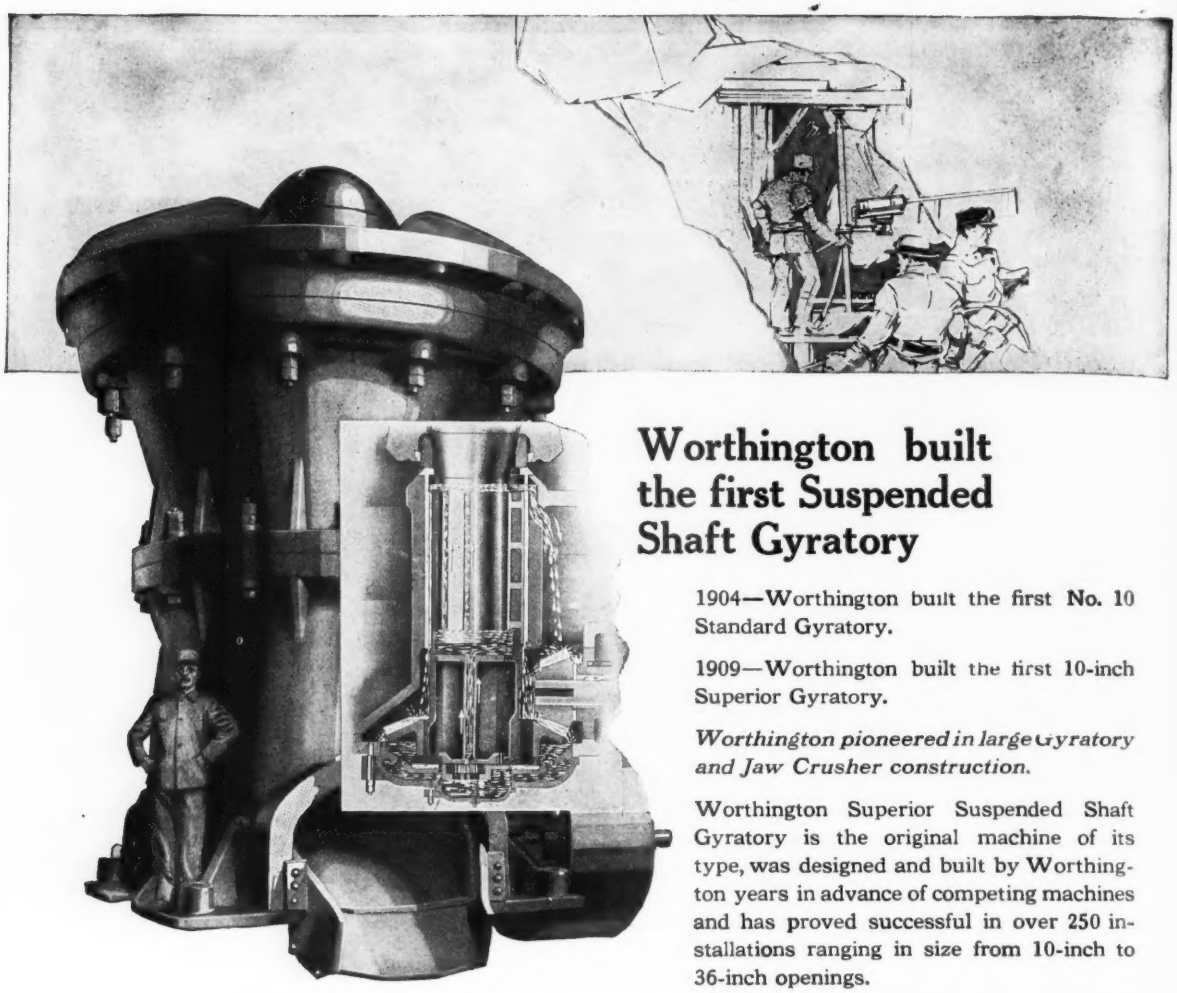

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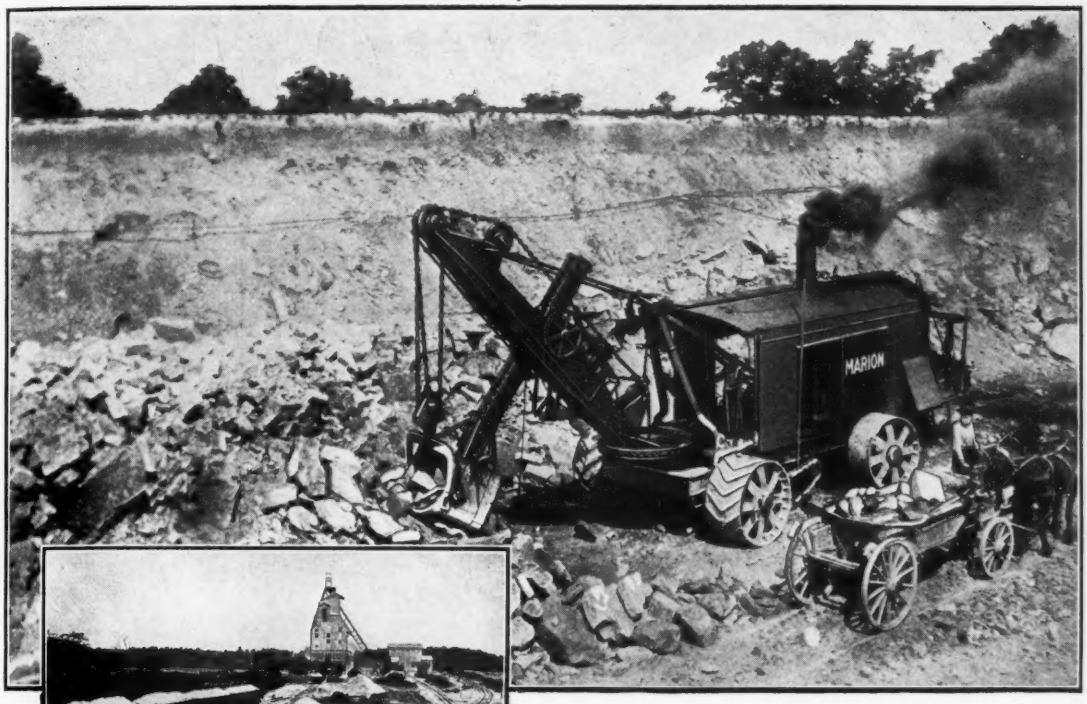

This stone, loaded by "Marion" Shovels, will soon be used on Marion-built roads and streets, and for concrete buildings with Marion-dug basements. "Marion" Shovels see the job through.

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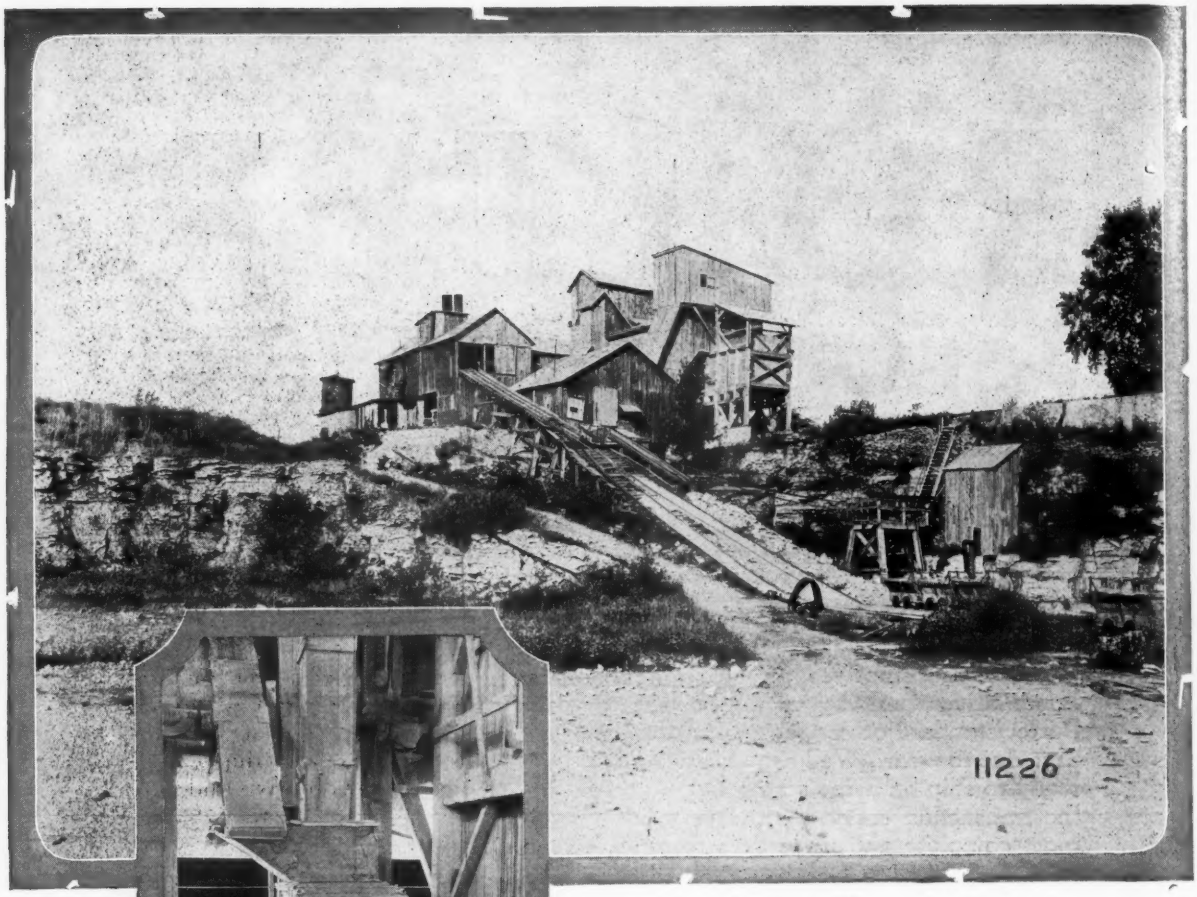

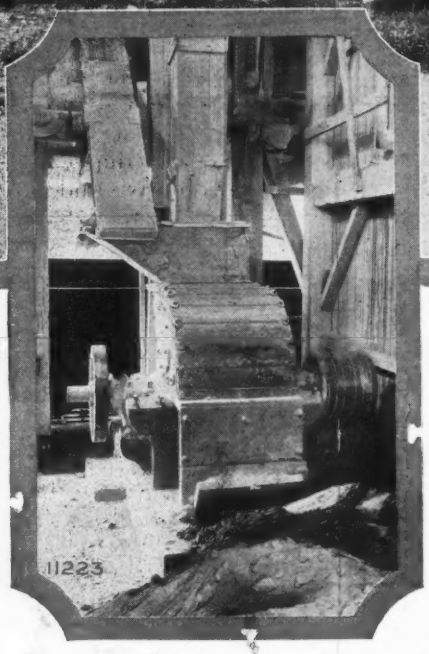

Jeffrey Type "A" Swing Hammer Pulverizer in operation at the plant of the Broken Sword Stone Co., Bucyrus, Ohio.

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AETNA

It does the work!

Rock Products

Vol. XXIII Chicago, April 10, 1920 No. 8

Use Famous Old Shaft Kilns to Make "Brixment"

Natural Cement Plant of the Louisville Cement Company Put to Use in Manufacture of New Patented Product

"LOUISVILLE" CEMENT dates back to 1868, when the first cement plant of the Louisville Cement Co. was built at Speeds, Ind. The capacity of the original plant was 700 bbls. per day. This was a natural cement or hydraulic lime, burned in shaft kilns.

From this beginning the plant grew gradually until in 1895, when it was turning out 4,000 bbls. per day. From that time on the rapid increase in the use of portland cement caused a decline in the manufacture of natural cement, and in 1905 the old natural cement plant was practically abandoned. In that year the company's portland cement mill was erected, a short distance away from the battery of old shaft kilns.

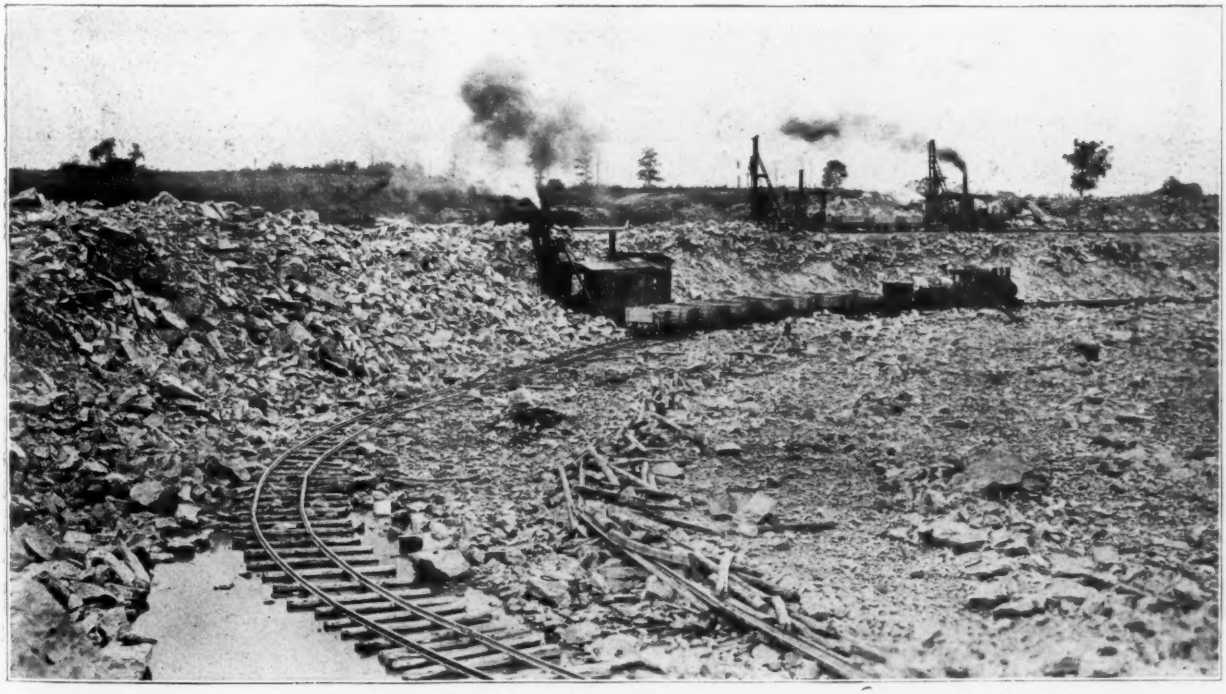
Quarry Operation

The quarry is rather unusual. There is 12 to 15 ft. of clayey limestone (natural cement rock) under which is a very pure high calcium limestone. Of course only the top layer or stratum was used in the manufacture of natural cement, while present manufacturing methods make it feasible to use only the lower or high calcium stone and shale in the production of portland cement.

The clayey limestone must be stripped to get at the high calcium stone and a thorough investigation was made to develop the best possible commercial use for it. The solution of the problem has been the manufacture of "Brixment," a patented mason's cement particularly adapted for laying up brick and tile.

What Is Brixment?

Brixment has been made and marketed since 1917. It is the invention of



Limestone quarry of the Louisville Cement Co. at Speeds, Ind.; cement rock stratum above and high calcium rock below

Harry D. Baylor, chemist, and now superintendent of the Speed plant of the Louisville Cement Co. Patents were granted him on December 2, 1919 (Nos. 1,323,952 and 1,323,953), and the material is described by him as follows:

"My invention relates to the production of hydraulic cement, but not necessarily 'natural' cement, and the object is to produce a cement which will set slowly, thus affording plenty of time for handling and finishing.

Slow Setting Feature

"It is now recognized by authorities that the initial set in hydraulic cement is due to the break-up of the calcium aluminates in the cement upon the admixture of water. During this break-up lime is liberated which undergoes hydration to calcium hydrate, and it is this phenomenon that is recognized as causing the quick initial set of cement and is held responsible for its early strength.

"The final strength of the hardened cement is recognized as being due to the hydration of the calcium silicates present. It is generally accepted that the calcium aluminate strength reaches its maximum quickly and by the end of 30 days is quite largely lost. Consequently, the enduring strength of cement work is due to the calcium silicate compounds in the original cement. In natural cements, especially those containing a considerable proportion of free lime and aluminates, this early set takes place very fast; in fact, it often quite seriously handicaps the work, and with careless workmen much inferior cement work results; for often the workmen try to break the early set, thinking not to interfere with the final set, and frequently such procedure on the job results in the cement being worked when the final set is taking place, and consequently the cement work never gets as strong as it should.

"The object of my invention is to produce a cement which will avoid this quick initial set and will give time enough for the production of careful workmanship and superior finish in the cement work.

"To give a typical example of the method of practicing my process, I take 1,650 lbs. of natural hydraulic cement, 200 lbs. of quick lime (CaO) and grind them together in a suitable mill to about a fineness such that about 85% of it will pass through a 100-mesh screen. I then place the mixture in any suitable commercial type of lime hydrator and add the amount of water necessary for the complete hydration both of the lime which is added and that which results from the break-up of the calcium aluminates. While the amount of water will of course vary with the proportions and characteristics of the constituent elements, the amount of water required will usually run in the neighborhood of about 150 lbs. Thus in an ordinary case in each ton the natural cement will constitute about 82½% of the total; the quick lime about 10% of the total, and the water about 7½%. But, as stated, these proportions will vary with cements of varying composition.

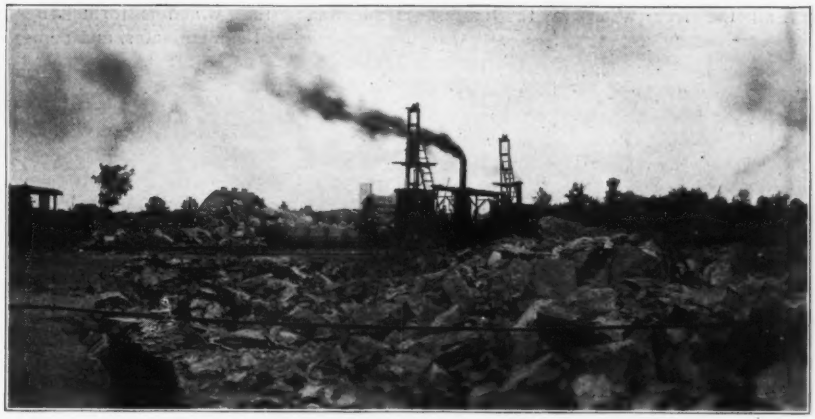
"When the reaction has taken place, the mass is discharged from the hydrator in dry form after which it is ground in any suitable type of mill. The product is then ready for bagging and shipment.

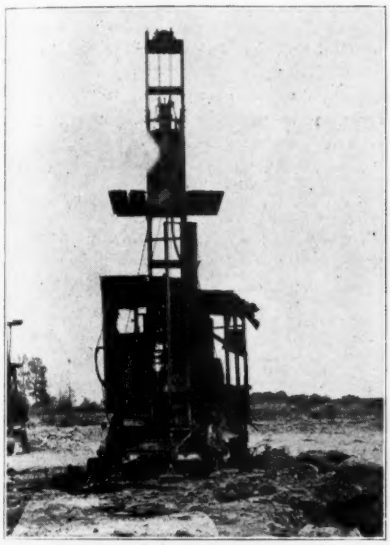
"As a result of this process, I change a quick setting hydraulic cement; that is, one in which the initial set occurs in from 5 to 10 minutes, to a slow setting one, with an initial set running from 4 to 8 hours, and with the final set in excess of 9 hours. This cement can be retempered or reworked at any time up to 9 hours without losing any of its final strength, and with my product the strength is equal to the strength of the original cement before treatment.

"While I do not wish to be understood as making definite representation in this regard, it is my understanding that the underlying principle of the above process is that the quick-setting calcium aluminates are permitted to break up chemically and recombine without permitting them to solidify the mass. The prevention of solidification is caused not only by the mechanical action of the hydrator, but also by the physical action of the lime during its hydration; for it is well known that the hydration of lime is accompanied not only by the generation of heat, but by the physical expansion of the constituent molecules as the elements combine.

"In my process the excess calcium oxid added to the mass commences to undergo its hydration with the extra water before the calcium silicates are affected; and the affinity of this free lime for water is so strong that when the action is once started, the lime either chemically absorbs or, by the heat generated, vapor-

Shale bank of the Louisville Cement Co. at Speeds, Ind; portable pumping plant (Rock Products, Feb. 28, p. 27) at left





Various views of Louisville Cement Co. limestone quarry at Speeds, Ind. Note use of wagon type of steam drill

izes all the free water in the mass. Hence, when more water is added, as will be done when the resulting cement is to be used, only the slow setting silicates retain their ability to set and the quick setting substances in the original mass have had their setting properties destroyed.

"Having thus described my invention what I claim as new and desire to secure by Letters Patent, is:

"1. The process of slowing the setting properties of aluminate containing cement consisting in comminuting the untreated cement, mixing calcium oxid with it in a proportion between 6 to 1 and 10 to 1 by weight, and stirring into the mixture the amount of water approximately necessary for the complete hydration of all the free calcium oxid in the mass, including that added as quick lime and that resulting from the break-up of the aluminates.

"2. The process of converting quick-setting cement containing an aluminuate to a slow-setting cement consisting in comminuting the cement, mixing calcium oxid with it and stirring in the presence of enough water to hydrate the free calcium oxid, including the amount added and the amount which results from the break-up of the aluminates.

"3. The process of converting quick-setting cement containing an aluminate to a slow-setting cement, consisting in mixing the cement with lime in the proportion of approximately eight parts of cement to one of calcium oxid, comminuting the mixture and stirring in the presence of enough water to hydrate the free calcium oxid, including the amount added and the amount which results from the break-up of the aluminates.

"4. The process of converting quick-setting cement containing an aluminate to a slow-setting cement consisting in mixing the cement with quick lime and water approximately in the following proportions by weight: Untreated cement, 81½%; quick lime, 10%; water, 7½%, and comminuting the resulting mass.

"5. As a composition of matter, slow-setting cement having its calcium aluminates hydrated and containing additional hydrated calcium oxid over that resulting from the break-up of tne aluminates and from the hydration of the free lime in the original cement.

"6. The composition of matter resulting from grinding natural cement and quick lime, adding sufficient water to hydrate the added lime and the lime resulting from the hydration of the aluminates of the cement, and comminuting the resulting mass.

"7. As an article of manufacture, cement resulting from mixing an aluminate containing cement with quick lime, comminuting the mixture, mixing with enough water to hydrate the lime which is added and that which is formed by the break-up of the aluminates, and comminuting the resulting mass.

"8. Slow-setting cement produced by taking natural cement and quick lime in the proportions of about 8 to 1, grinding them together, adding about 1 part of water to every 12 parts by weight of the mixture and comminuting the resulting mass.

"9. As a composition of matter, cement containing silicates and aluminates, the aluminates being in hydrated form and the silicates in anhydrous form.

"10. As a composition of matter, cement containing lime in anhydrous form, an aluminate substantially in hydrated form and a silicate chiefly in anhydrous form.

"11. As a composition of matter, comminuted cement containing lime in both hydrated and anhydrous form, calcium aluminate chiefly in hydrated form, and calcium silicate chiefly in anhydrous form.

"Fatness" Feature

"My invention relates to the production of hydraulic cement and the object is to render the cement slow-setting and to impart to it a special degree of plasticity or 'fatness,' to make it easier to work and capable of receiving a better finish. Another object is to render the cement to a certain degree water proof. As a result, when set and dried, the mortar work resists moisture, instead of absorbing it, and this renders the work practically immune from the effects of frost or freezing weather. One of the characteristics of my invention is that the fatty or waxy content of the cement is most completely, minutely and uniformly distributed throughout the mass.

"To give an example of my present process, assuming that it is desired to operate upon a batch of one ton weight I take about 1,620 lbs. and mix with it about 200 lbs. of quick lime. These are ground to a fineness such that about 85% of it will pas screen of 100 mesh. I then place the ground mixture in an ordinary commercial hydrator and add just sufficient water (as near as may be determined) to completely hydrate both the calcium oxid which was added and such amount of calcium oxid as may be formed by the break-up of the aluminate in the mixture. At the same time; that is, during the hydration of the lime, I add about 30 lbs. of unsaponifiable oil or waxy material. As a cheap and suitable material for this purpose I may use the so-called 'slops' resulting in the commercial production of paraffin. This material is not suitable for refined paraffin of commerce but will answer my purpose, as it has the waxy characteristics and enables me to use what would otherwise be practically a waste product. The stirring in the hydrator is continued until the water all combines, whereupon the dry mass is removed from the hydrator and ground.

"It will be understood that the foregoing proportions are illustrative only and that they will vary with different samples of cement; for natural cement is of course a variable product. The amount of waxy material may also be varied, although I have found that 30 lbs. to the ton will be sufficient to produce a distinctly advantageous effect in ordinary cases.

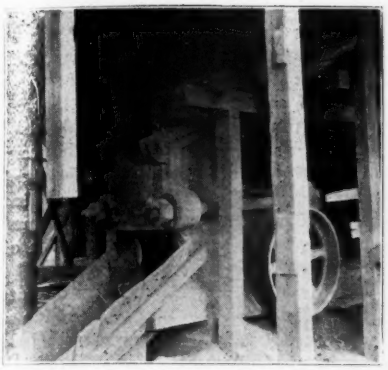
"The cement produced by the above described process is not only slow-setting but has a remarkable degree of plasticity or fatness which renders it of special utility in brick and tile laying where cement mortar is required—for the mortar can be mixed in larger batches, be tempered more slowly and enable the workmen to produce a more workmanlike and careful job.

"My understanding is that the high quality of cement produced by this process results from two facts:

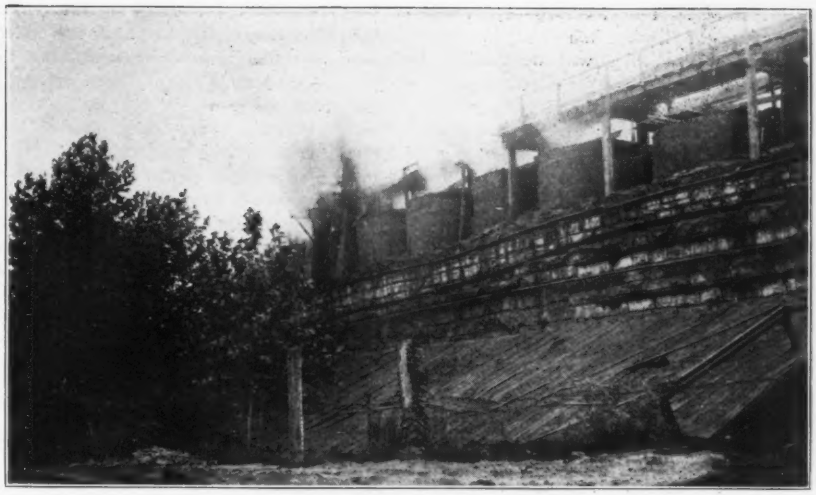
"First: That the predetermined and limited amount of water which is added is taken up entirely by the lime and quick-setting aluminates, but that these are prevented from solidifying the mass by the constant agitation to which they are subjected, this agitation being produced both mechanically by the action of the hydrator and chemically or chemo-mechanically by the reaction occurring between the lime and the water.

"Second: That the hydration of the lime has a particular effect upon the unsaponificable waxy material. When lime hydrates it both generates heat and increases considerably in bulk. By introducing the waxy material at the same time as the water advantage is taken both of the heat, which increases the fluidity of the waxy matter, and of the physical 'working' of the lime as the molecules move relatively to each other during the reaction which occurs. The particles, in rubbing upon each other, seem to promote thorough distribution of the fluid waxy material. In addition, as the lime has an affinity for the water, in drawing the water to the different particles of itself the lime also draws some of the fluid waxy material; in other words, particles of the oily matter are 'entrained,' so to speak, with the water, and hence the oil becomes very thoroughly diffused throughout the mass. As a result of this process the oily or waxy material is diffused to a degree of thoroughness which probably could not be obtained in any other way—commercially, at least.

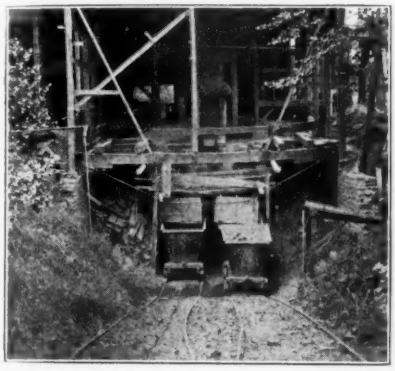
"The thorough admixture of the oily or waxy material renders the cement water proof to a great degree, thus enabling the mortar, when set, to keep out dampness. This of course makes the set or hardened mortar proof against the



One of the old original Blake jaw crushers dating back to the eighties—still doing good work

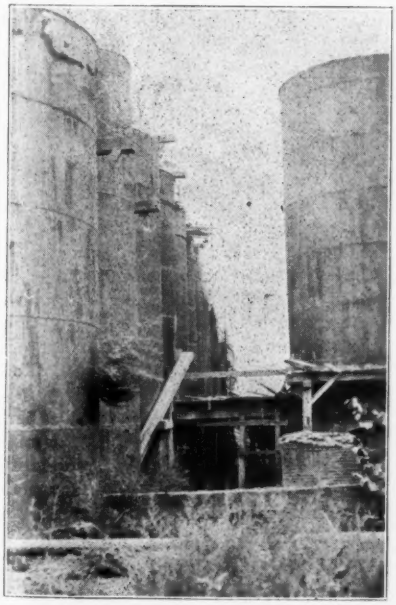


Battery of old shaft kilns now making ingredients of "Brixment"



Crushing plant of old natural cement plant, still in use—incline to tops of kilns

Another view of kiln battery—once had capacity of 4,000 bbls. per day



Battery of shaft kilns originally built to burn "Louisville" natural cement

Double row of kilns with dumping track in center

effects of frost or freezing—a great advantage in laying tile and in laying bricks where they will be subject to weather conditions.

"Having thus described my invention what I claim as new and desired to secure by Letters Patent, is:

"1. The process of rendering cement slow-setting and plastic consisting in adding quick lime to the cement, comminuting the mass, then adding oily or waxy material and simultaneously stirring in the presence of an amount of water sufficient to hydrate all the calcium oxid and finally grinding.

"2. The process of treating cement containing an aluminate consisting in bringing together cement and quick lime, comminuting and intimately mixing the same, adding oily or waxy material and an amount of water sufficient to hydrate the amount of lime, both original and derived, stirring the mixture and grinding the resulting mass.

"3. The process of treating cement to render it more plastic and slow-setting, consisting in adding to the cement an unsaponifiable waxy matter and utilizing the reactive effects of quick lime and water together with a mechanical stirring action, to diffuse the waxy matter throughout the cement and to destroy the setting characteristic of any quick-setting ingredients of the original cement.

"4. The process of treating cement to render it more plastic and slow-setting, consisting in adding to the cement an unsaponifiable waxy matter and utilizing the reactive effects of quick lime and water together with a mechanical stirring action, to diffuse the waxy matter throughout the cement and to destroy the setting characteristic of any quick-setting ingredients of the original cement, the water being limited to an amount sufficient to hydrate all the quick lime, both that which is added and that which is derived during the mechanical stirring; and the resulting dry mass being finely comminuted.

"5. The process of treating cement containing aluminate consisting in bringing intimately together cement and quick lime in the proportion of approximately 8 to 1, adding unsaponifiable waxy matter to an amount roughly equal to one-sixtieth of the weight of the cement and lime, mixing with water to an amount sufficient to hydrate both the lime which is added and the lime which results from the break-up of the aluminates, and then finally comminuting the resulting mixture.

"6. The process of treating cement containing aluminates consisting in mixing the following substances in about the proportions mentioned, viz.: 1,620 lbs. hydraulic cement, 200 lbs. of quick lime, finely comminuting them, then adding about 30 lbs. of unsaponifiable oily or waxy material together with enough water to hydrate both the added lime and the lime which is formed by the break-up of the aluminates, agitating the mass while the water and oily or waxy material are being added, and finally grinding the resulting mass.

"7. The process of treating natural hydraulic cement consisting in adding in about the proportions mentioned 200 lbs. of quick lime to about 1,620 lbs. of the cement, finely comminuting and mixing them, then adding water and about 30 lbs. of unsaponifiable oily or waxy material, these two latter being added simultaneously and at the same time being stirred into the mass, and finally grinding the resulting mass.

"8. The composition of matter produced by intimately mixing hydraulic cement containing aluminates with quick lime in the proportions of about 1,620 lbs. of cement to 200 lbs. of lime, adding and simultaneously stirring into the mixture about 30 lbs. of oily or waxy material, the amount of water being just sufficient to sydrate both the lime which is added and that which results from the break-up of the aluminates, and finally comminuting the resulting mass.

"9. The composition of matter produced by intimately mixing hydraulic cement containing aluminates with quick lime in the proportions of about 1,620 lbs. of cement to 200 lbs. of lime, adding and simultaneously stirring into the mixture about 30 lbs. of oily or waxy material and about 150 lbs. of water, and finally comminuting the resulting mass."

Manufacturer's Claims.

Brixment is described by its manufacturers as "a slow-setting, plastic, smooth-working cement for masonry. It is the product of fifty years' experience in manufacturing cements."

The following claims are made for it: "Brixment does not require soaking or any preliminary preparation. It is ready for use immediately after mixing, either in summer or winter; and it may be mixed near the work, as mortar is required by the mason.

"It sets in about four hours. It may be retempered, if necessary, without material impairment of strength, but retempering any good cement is bad practice. It fills the demand of discriminating architects for a reliable, straight, practical mortar which can be conveniently made in the proportions specified and which will prove better than lime mortar or mortar made of lime and cement.

"It pleases the builder because it works long and buttery; because joints may be struck quickly and more brick can be laid in a given time than with other cement mortars. It is packed four cloth sacks to the barrel. Each sack weighs 75 lbs. and contains over one cubic foot —a cubic foot weighing 70 lbs. It is convenient to mix, therefore, in any proportions that may be specified.

"Mixed one to three with clean, sharp sand, or eight sacks of brixment to one yard of sand, makes a mortar that in a short time equals building brick in crushing strength. It is so finely ground that 98 per cent will pass through a sieve of 10,000 meshes per square inch. As the coarser particles of all cements are inert, brixment is 100 per cent efficient.

"It is hydraulic—it sets in air or water, therefore it is especially adapted for use underground or in damp places. Joints made of it are nearly damp proof."

New Arkansas Agricultural Limestone Development

LITTLE ROCK, ARK.—White Cliffs, on Little River in southwestern Arkansas, is expected to provide the means for bringing this state into the front rank of agricultural commonwealths. A plant has been established there by the White Cliff Chalk & Marl Co., which proposes to furnish ground limestone to farmers at $1 a ton f. o. b. plant, making the cost delivered at farms almost anywhere in the state not more than $2.50 a ton.

An idea of the value of the limestone thus made available to Arkansas farmers as a fertilizer may be had from the written opinion of Prof. Branner, an eminent geologist and president of Leland Stanford University of California: "If this limestone were distributed over the farms of Arkansas it would be of more value to the state than all the gold California has ever produced."

Extremely Soft Stone

There are 900 acres of land underlaid with soft limestone to a depth of about 150 feet. It is said to resemble the famous chalk limestone of Dover, England. The rock which gave White Cliffs its name is composed on an average of about 90 per cent calcium carbonate. It is so soft that it can be easily broken with the hands and rapidly disintegrates when exposed to the elements.

The place was famous long before the Civil War. The limestone was then prepared by simply scooping a hole in the soft formation, filling it with pieces of the rock and building a fire beneath it. The lime thus obtained was shipped out by steamboats.

Abandoned many years as a lime producer, it later was the scene of a $2,000,000 investment by Dutch capitalists who erected and operated for a while a portland cement plant. Because of the plant's inaccessibility, fuel scarcity and their refusal to introduce modern methods, the foreigners finally gave up the enterprise and the property has not since been utilized.

Quarry Industries of the South Show Signs of Prosperity

Every Prospect of the Best Year on Record, Car and Coal Shortage and Labor Conditions Notwithstanding

By C. F. Trefz
Associate Editor, Rock Products

AN EXTENSIVE road-building program, a revival of general construction and building and a large prospective demand for railroad ballast are the factors which seem to assure a prosperous season for all the rock product industries of the Southeast.

This general condition finds most plants with exhausted storage reserve, and many large orders on the books. All producers are investing considerable time, effort and money to increase their production to a maximum. In many cases the growing market has induced the development of new plants where it was at all possible to make railroad connections to the deposits. Owing to the fact that there are but few commercial sand and gravel developments in the interior and because of the many suitable stone deposits, the quarry industry monopolizes almost the entire mineral aggregate field.

Working adversely to these factors which demand maximum production are a shortage of transportation equipment insufficient coal and uncertain labor elements.

The Transportation Situation

Car shortage has been, of course, universal and has affected shippers using open-top and box car equipment about the same. The degree of car shortage has varied in different sections and with different industries. It seems that the shippers of agricultural limestone in the South have suffered less than other shippers. This is because agricultural limestone is very extensively used in the South as a filler for fertilizers and shippers have had the influence of the fertilizer manufacturers in moving it.

It was also found that the proportional supply of cars was considerably dependent upon the effort made to get cars. In cases where producers have systematically investigated each car shortage and made known their needs to railway officials the subsequent shortages have not been so great nor occurred so frequently.

Since the railroads have been restored to private management some lines have been short of cars, due to the general movement on all roads to return foreign equipment and to get their own rolling stock back. As soon as this movement is complete Southern shippers generally believe the car shortage condition will be much improved..

It was observed that southern quarry plants are in general served by only one railroad, thus limiting their operation as compared with many northern operators whose plants are served by several roads. This condition necessarily reduces the shipping facilities and radius, making it almost impossible and often very undesirable to build and operate large plants.

Fuel Supply

But few producers were able to store sufficient coal to carry them over the coal miners' strike, and some of those who did have sufficient coal for that crisis have since, at one time or another, been forced to shut down for lack of coal. The isolated positions of most of the southern stone plants make it impossible to use purchased electric power and they are dependent upon steam.

In all cases the coal reserve is undesirably low and until it can be built up, continued operation will be problematical. It seems to be the general policy to try to build up coal reserves in the future, instead of living from hand to mouth.

Southern Labor Problems

The southern labor market, though not particularly short, has offered considerable difficulty and has considerably affected the industry as a whole. With the exception of the mountainous districts, the bulk of the laborers are negroes. In the mountainous districts there is an abundance of sturdy white natives who are good steady workers. Where there are sufficient of them the labor problems are easily solved. Partly because of the cool weather of the higher altitudes, perhaps, the amount of work done per man is considerably in excess of the average lowland negro.

The negro is neither a hard nor a steady worker, and an employer must cope not only with rather inefficient laborers, but also a very variable force. The negro does not quit his job so readily, but frequently lays off for a few days' rest without a notice, so, although there may be a full force one day, several may be missing on the next. Very nearly all these southern quarries are hand-loading operations, and in order to minimize the results of labor fluctuation, nearly all quarrying is done on a piecework basis.

Because of the isolation of the plants and the peculiar labor conditions, even the smallest quarry operators have to build small settlements about their plants for their employes. The houses are rented to the men at a nominal charge and are maintained by the company. In addition to this, each company operates a commissary.

The housing problem is further complicated by the color line, for it is necessary, of course, to have two separate communities and two standards of houses—one for the negro and another for the white employees.

General Conditions

It has been the practice at a number of plants in the past to lay off all of the men when there was a serious breakdown. The inevitable result was that upon resumption of activities there would be no effective organization and several days of undercapacity production would be necessary until the forces were replenished. Experience now shows that it is better to keep the bulk of the force, at all costs, so that the organization may be kept intact. This has considerably increased the overhead operating expenses, but has made possible much better service.

In conclusion it might be said that although the wage of the southern laborer is not so much as is paid farther north, the efficiency of the northern laborer generally more than makes up for the added wages. On the other hand, the abundance of negro laborers in the South really gives the southern producers the largest supply of available labor under present conditions throughout the country.

Expecting that car service will rapidly improve, with little likelihood of serious labor trouble, and with a moderate supply of coal, the Southeast district stands ready and capable of eclipsing the production of any previous year. The business on hand and the unit prices are sufficient to make it desirable for every producer to put forth maximum effort.

Up-to-Date Stone-Washing Plant

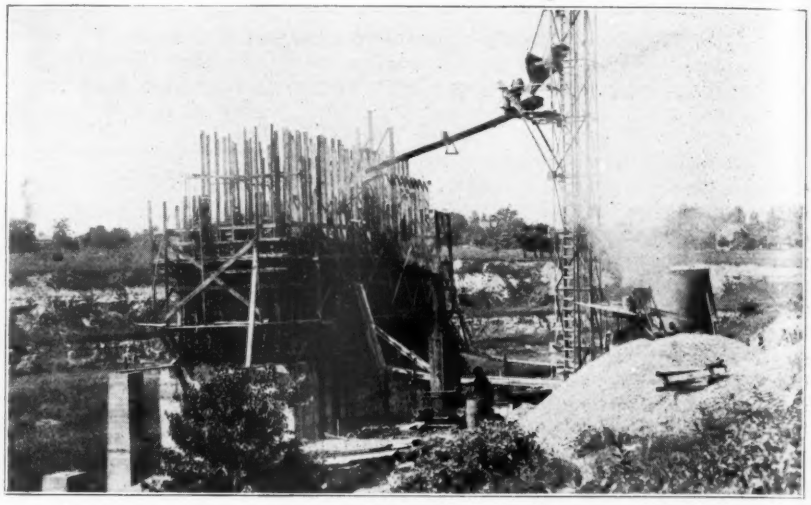
THE BESSEMER LIMESTONE & CEMENT CO., Youngstown, Ohio, formerly the Bessemer Limestone Co., completed last season one of the few commercial crushed-stone washing plants in existence. This quarry company, like many others, was confronted with the problem of disposing of a large amount of dirty screenings.

The company operates a number of limestone quarries within a radius of a few miles of Hillsville, Pa., and has a large commercial crushed-stone and fluxing-stone plant and an agricultural limestone pulverizing mill. Owing to the presence of stripping in some of the stone quarried it has not been used to make agricultural limestone dust, but has been wasted in a huge pile at one end of the plant.

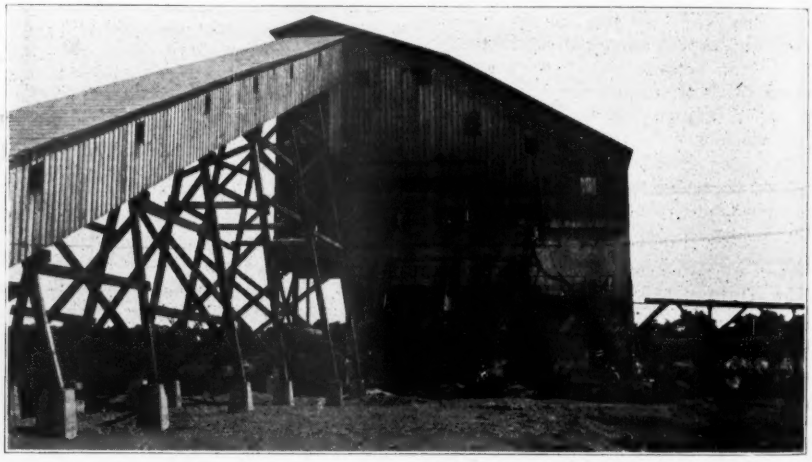
The value of this stuff, if it could be cleaned, was recognized and the washing plant illustrated is the method selected to do the job. This plant was in operation all last year and was highly successful. A ready market was at once found for the clean stone chips recovered and the remaining stone, recovered as crusher sand, was also much in demand for concrete work.

Washing and Screening Plant

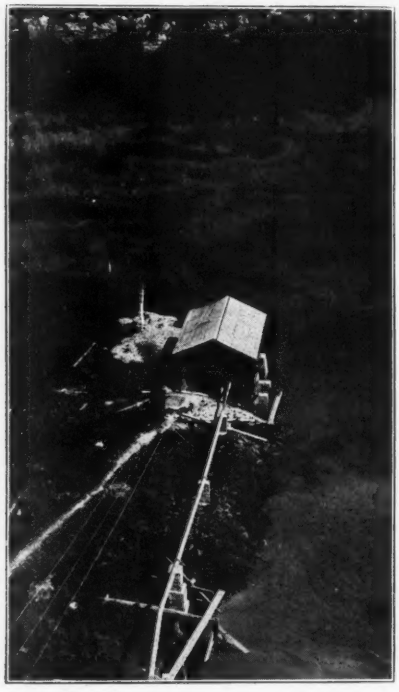
The washing plant was placed at the edge of an abandoned, or worked-out,



Stone-washing plant of the Bessemer Limestone and Cement Co. under construction

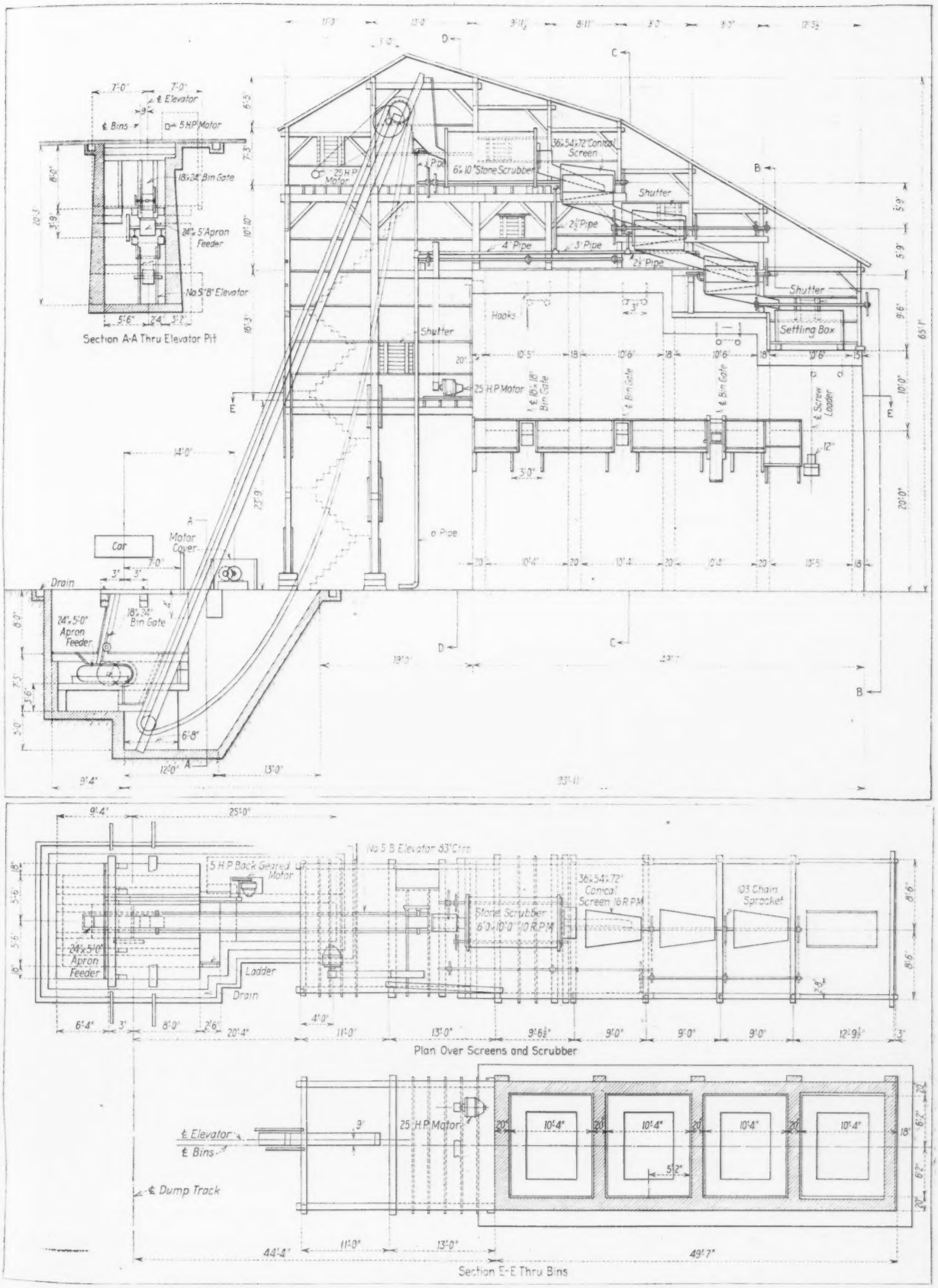


Plant completed. Note belt conveyor instead of elevator shown on plans

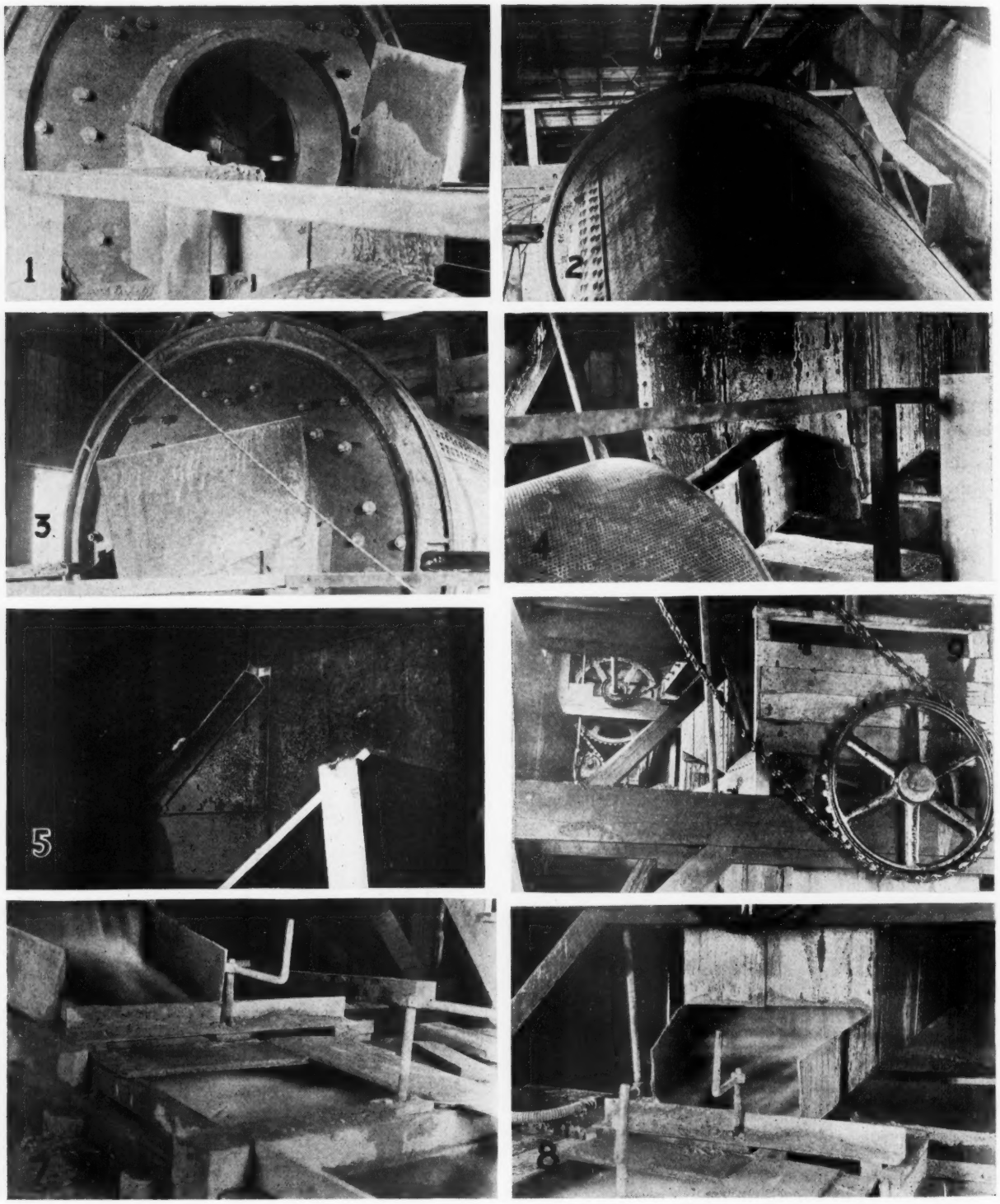


Water supply from old quarry pit

Storage pile of limestone screenings to be washed


Section A-A Thru Elevator Pit
Plan Over Screens and Scrubber
Section E-E Thru Bins

Machinery Details of a Crushed-Stone Washing and Screening Plant



INTERIOR VIEWS OF WASHING PLANT OF BESSEMER LIMESTONE AND CEMENT CO.

Views (1), (2) and (3) show 6x10-ft. scrubber; (4) fine screen; (5) elevator discharge to scrubber; (6) screen drives; (7) and (8) "sand" settling box

quarry pit. Enough water collects in this pit to furnish the wash water for the plant, and of course it also serves as a sump for the disposal of the silt and dirt washed out of the stone.

The original plans prepared by the Allis-Chalmers Mfg. Co. of Milwaukee, Wis., are shown on the accompanying pages. These were subsequently changed by the substitution of an inclined belt conveyor for the bucket elevator shown. This is brought out in the views of the plant. Otherwise the plant is as shown on these plans.

It was originally planned to bring the material from the storage pile to the receiving hopper and apron feeder of the belt conveyor by means of a narrow-gauge railway and side-dump cars, as shown in the views. After a few months' experience with this method of operation a tunnel was driven under the storage pile and the material is now recovered by a belt conveyor through openings into this tunnel.

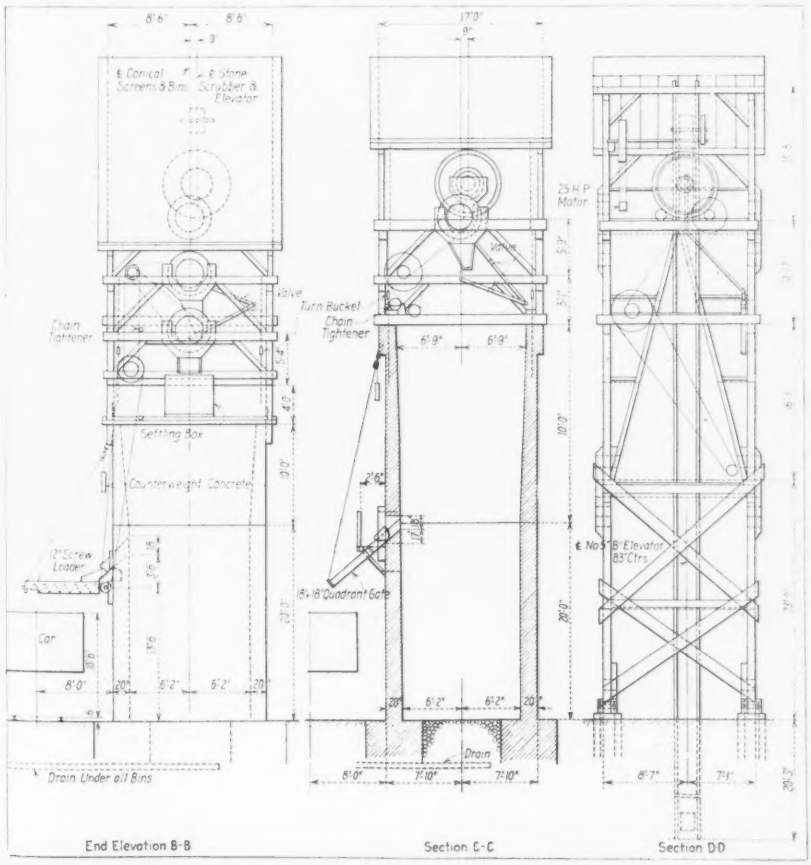
The principal details of the plant are shown in the accompanying views and plans. The plant does not differ essentially from an ordinary sand and gravel washing and screening operation. The material is first passed through a large cylindrical scrubber and then through a battery of three Gilbert type screens and a large settling tank of the continuous bottom-discharge type.

Two sizes of clean screenings are now recovered—a coarse crusher sand and a fine crusher sand. Bins for the finished material are located directly under the screens and settling tank. The bins and substructure of the plant are of reinforced concrete, as shown.

The scrubber and screens are driven from a single electric motor by means of gears and chains. There is a separate motor for the belt conveyor and the centrifugal pump in the quarry pit is electrically driven.

F. R. Kanengeiser, vice-president and general manager of the company, had general supervision of the design and construction of the plant. C. G. Montgomery is superintendent of quarries and Otto Johnson is superintendent of stone-crushing and washing plants.

This company is now building a cement plant. When this is in operation the Bessemer Limestone & Cement Co. will be about the most complete "limestone products" plant in the country.



Details of crushed-stone washing plant of Bessemer Limestone & Cement Company

Construction Progress of Large Illinois Crushing Plant

THE FOLLOWING excerpt from a letter written by G. S. Tracy, Burlington, Ia., to a local paper, gives some recent information as to the construction progress of the Monmouth Stone Co., Monmouth, Ill., which was referred to on page 19 of the Sept. 17, 1919, issue of ROCK PRODUCTS.

"The excavation for the large No. 12 crusher has been made and we have an expert concrete man, employed for thirty days, to do all the concrete work necessary for its completion.

"The Illinois Steel Company of Jacksonville, Ill., which has the contract for the building, has shipped their 100-foot derrick. Their men are now on the ground and expect to begin erecting the steel this week.

"All the crushing machinery, amounting to 300,000 pounds, is finished and ready for shipment.

"Our switch tracks and sidings have been constructed and we are now running our own train.

"Two camps have been built and the employees are now taken care of on our own grounds.

"We have a sales force organized and will start next week to take orders for material. A company from Chicago is already offering to take a thousand cubic feet per week of large block stone at $10.50 per ton.

"The railroad company has established a station at the quarry and some of the trains are making regular stops when they have passengers.

"With ordinary weather it is expected to begin the stripping of the sand from the top of the stone next week.

"The general plans of the company have been followed out to the letter and unless some unforeseen trouble arises we will be operating some time during the month of May."

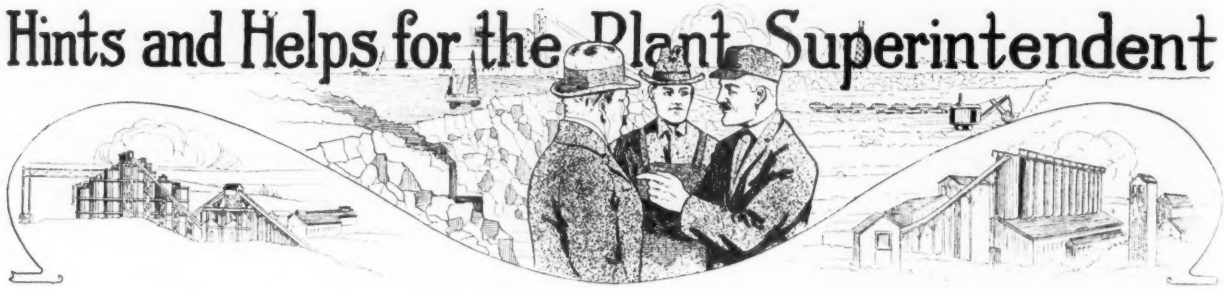
Another Penitentiary Shy of Prisoners for Quarry Work

ATTENTION was recently called to the dire effects of prohibition in a certain New Jersey county which will have to buy crushed stone instead of producing it by prison labor. Now a dispatch from Solvay, N. Y., states:

"County officials are extremely alarmed about the comparatively small inmate population at the Onondaga County penitentiary and the county is in danger of having the quarries at the institution as a liability instead of an asset.

"The pen has not enough men to man the quarries and unless there is a big increase in pen population this summer the production of crushed stone is likely to be greatly curtailed. Superintendent Charles Livingston of the institution declares that he will need all the penitentiary prisoners for work on the farms and cannot spare them for quarry work."

Hints and Helps for the Plant Superintendent



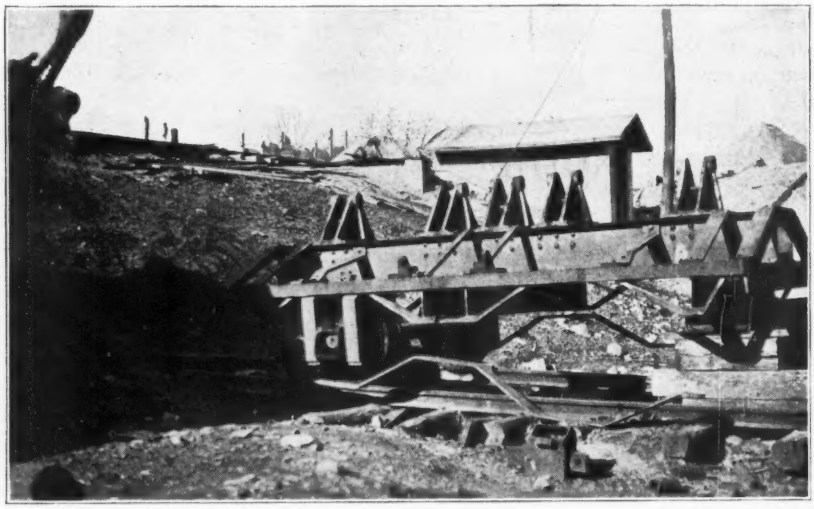
Strengthening Quarry Cars

THE VIEWS BELOW show how a prominent Ohio quarry operator strengthens and reinforces a well-known type of quarry car. Like other quarry men, he finds it hard to get manufacturers to face facts rather than theory.

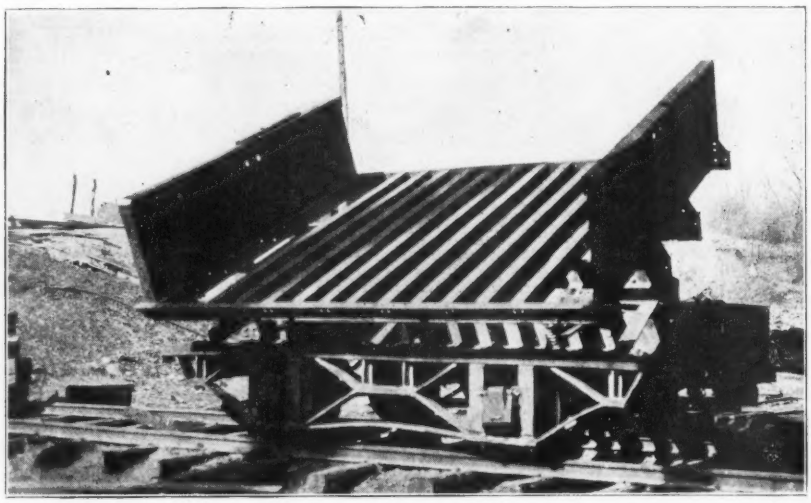
The number of the castings which carry the dump body is increased to five by the addition of the center one. The castings themselves are reinforced by putting a bolt through them and the floor of the car is strengthened by the closer spacing of the floor beams. The floors themselves are of heavy oak plank.

In addition to the above several steel straps are added to give greater rigidity to the frame. With these slight additions the car gives far longer and more satisfactory service.

Incidentally this job shows why a modern quarry or gravel pit needs an up-to-date machine shop. This particular plant has one of the best.



Adding extra casting and steel bolts and straps to give quarry car greater lasting power



Strengthening quarry car by closer spacing of floor beams

Selection of Crusher for Granite Macadam Stone

A LETTER received from a subscriber to ROCK PRODUCTS in Northern Europe states: "We should like to see a discussion in your paper regarding stone-breaking machinery for macadam purposes.

"We intend enlarging our macadam plant for a production of say 400 tons per day, and in accordance herewith we have made inquiries for breakers both in America and England.

"The American makers recommend us to take a gyratory breaker No. 6, saying they produce the most cubical sample and need the fewest repairs. The English makers, however, recommend jaw breakers, saying these machines give the best sample for macadam purposes and in comparison with the gyratory breakers, they need very little repairing. Our connection in England, importing our stone, also recommends jaw breakers.

"We may add that the English as well as the American makers produce both jaw and gyratory crushers.

"Which type shall we choose?

"For your guidance we beg to say that the stone to be broken is a very hard and compact granite, of fine grain —a sample of which is sent you today per separate cover.

"According to our experiences, we have found it most practical to deliver the stone to the breaker in sizes of say 'man's lift' lumps. The breaker would so have to reduce the stone to 2¼-in. sizes, delivering the output to a rejection screen, leaving the rejections on a belt conveyor to the sizing screen, while the oversize goes back to the breaker.

"The finished product wanted is a cubical 2-in. macadam stone."—"Viking-Mac."

The above letter was submitted to Brownell McGrew, author of the series of articles recently published in ROCK

PRODUCTS on the design of rock-crushing plants. Mr. McGrew answers the queries as follows:

"I would most assuredly recommend a gyratory crusher, preferably a No. 6, with cast-steel spider and manganese-steel head mantle and concaves.

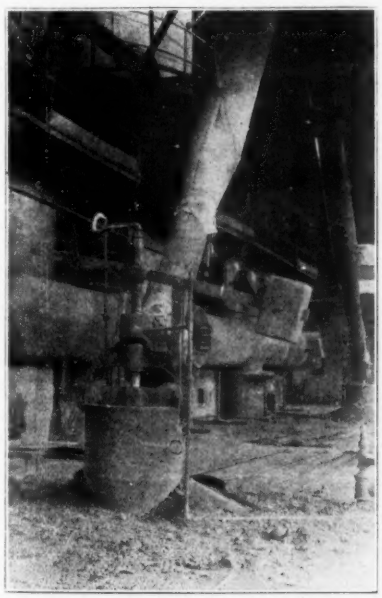
"So far as the reliability of the two types of crushers is concerned, there is very little to pick and choose between them. Either machine will stand up to the work, if properly designed and constructed. It may be that the English built gyratory will not stand up against granite; but the American-built machines have proven their stamina on hard rock beyond argument.

"A little thought should convince even the uninitiated that the gyratory will produce a more cubical product than will the jaw crusher—due to the annular discharge opening of the former machine. Also the gyratory, at a given opening, will pass from five to ten per cent less oversize material than the jaw.

"It is true that a jaw crusher of the required capacity would have a larger receiving opening than a No. 6 gyratory; but in this case there would be no advantage gained, as the stone is to be hand loaded.

"In the matter of power requirements the gyratory has the advantage by a long margin.

"In conclusion I would suggest that a small rejections crusher be installed to take care of the oversize from the primary breaker. The delivery of the rejections back to the first crusher is objectionable as it increases the work on this crusher and interferes with the feeding operation."



Fuel feeding spout for gas producer

Operating the World's Biggest Lime Kilns

THE LIME PLANT of the Palmer Lime & Cement Company, York, Pa., probably has the largest shaft kilns in operation of any plant in the world. These kilns are 25 ft. in inside diameter, 80 ft. high and have a capacity of 1,000 tons of limestone.

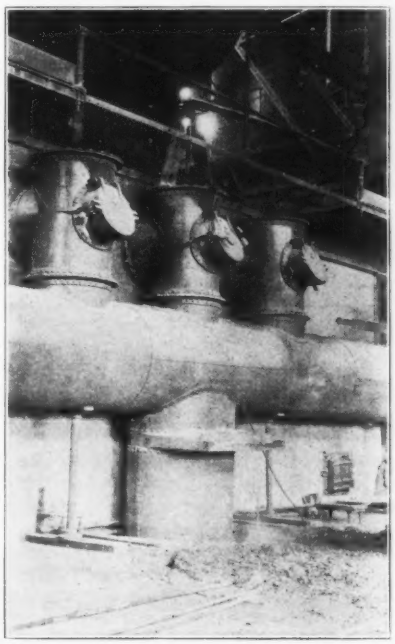
Each kiln is fired by two gas producers. The gas enters the kiln through twelve 16-in. inlets. Two men look after the firing of all the gas-fired kilns.

Each kiln is divided into four compartments and each produces about 75 tons of lime per day, 12½ tons being drawn about every four hours.

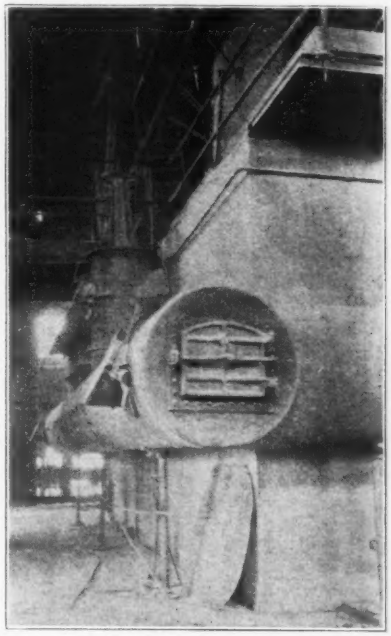
These kilns run through the year without repairs and, it is said, would run longer than a year but for the chance of being out of commission during the busy season. They are shut down during the winter, one at a time, and about a month is required to make necessary repairs.

Practically all labor at this plant, including the kiln tenders are paid by the piecework system. It has proved very efficient in this case.

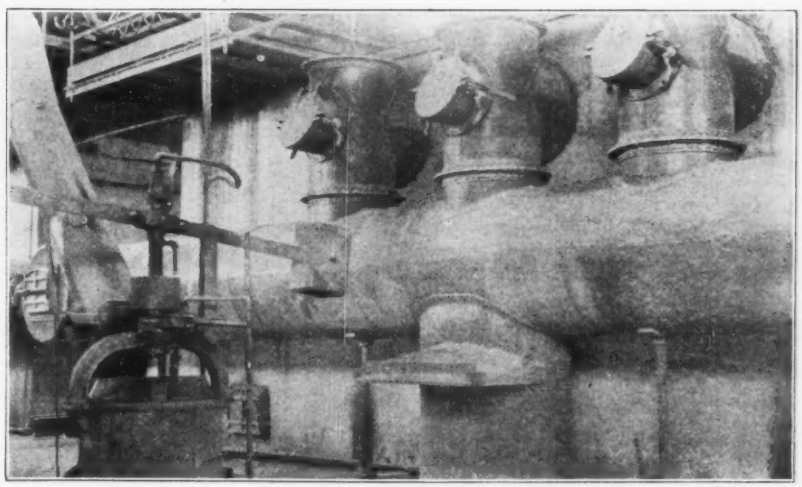
The general offices of the Palmer Lime & Cement Co. are at 103 Park avenue, New York City. Lowell M. Palmer, Jr., is president and Charles R. Leo, general manager. The superintendent in charge of operation at York is A. D. Pringle.



One of four gas inlets per kiln



Side view of gas inlets



One of two gas producers on each kiln

Equipment of a River Sand and Gravel Plant at Pittsburgh*

Keystone Sand and Supply Company Has Modern Labor-Saving Machinery, Steel Barges and Likes Non-Propelling Type of River Dredge

By Alex W. Dann

Vice-President and Treasurer, Keystone Sand & Supply Co., Pittsburgh, Pa.

IN THE SAND AND GRAVEL producing district of Pittsburgh, Pa., are three rivers—the Ohio, the Monongahela and the Allegheny. The Allegheny and the Ohio Rivers, where the material has not been depleted, have a deposit of anywhere from 20 ft. to 50 ft. of sand and gravel. That deposit in instances depending upon the part of the river in which we dig, is filled with boulders. Those boulders run all the way from the size of your doubled fist up to boulders which will weigh a couple of tons.

Another condition which we have there is that this material in the bed of the river is very closely cemented, that is, it often makes a sort of natural concrete in a great many places, so that it is sometimes difficult to break up.

These are two reasons to account for the fact that the pump boats are not used. Probably the third reason is that the producers there, when they first started the production of sand and gravel, which was in the early seventies, developed the ladder boat, which all have since adopted, the belief being that it is a more economical boat to use than the pump boat. J. K. Davison and brother were pioneer river sand men in this district.

Type of Dredge Used

Now I will describe one of these boats briefly. First, however, I will say that the type of boat is substantially the same in all cases, but certain variations are arrived at by the different companies.

Most of the boats, with the exception of those used by our company, are what are called the self-movable boats, that is, they resemble the ordinary stern-wheel steamboat, having a comparatively small wheel to the size of the boat. The boat under ordinary conditions can move itself back and forth around the river, although with any out of the ordinary conditions of current it is not able to navigate very safely. It is not always able to take its barges with it. The type of dredge which we use has no paddle wheel. We depend upon a steamboat to move it back and forth, unless it may be just for a short distance, and then it pulls itself on a line or works itself around with spuds and buckets.

Alex W. Dann

Our No. 4 dredge is the largest one we have. This boat originally had a hull 127 ft. long by 30 ft. wide and 6½ ft. deep. It is made of steel throughout. At the beginning of this season we increased the width by 8 ft. and the length by 15 ft. That boat weighs, with all the machinery on it, approximately 650 tons.

The principle of the ladder-dredge is the operation of an endless chain system of digging buckets, that is, a ladder frame hinged to a shaft in the middle of the boat with a channel left open down through the center of the hull about one-half of its length. This allows the ladder or frame on which the buckets run to be lowered or raised, as the case may be, by means of a head frame at the end of the boat. In our individual case we use a ⅞-in. line with 9 parts of line to raise and lower the ladder.

We have on the bucket chain close-linked buckets—that means no intermediate links, as is quite common in practice elsewhere. The buckets form the

*From a talk before the annual convention of the National Association of Sand and Gravel Producers, Chicago, Ill., February 13, 1920.

links, which means a continuous stream of material coming up. Our chain has 83 buckets. Each bucket will hold approximately 6 cu. ft. Each of the buckets weighs approximately 800 pounds.

Method of Operation

We will say, for instance, that we are starting to dig in a new place, or we are digging into the side of an island in a new place. The bucket frame or ladder is lowered down on the material, and the engine is started. The chain of buckets digs into the material and brings it up at a speed of 26 buckets per minute. The buckets dump on what we call a harp, which is a grate or screen consisting of a series of bars at the head of the ladder frame, high up in the boat, upon which the larger boulders that have been brought up in the buckets, are deposited and allowed to run back directly into the river.

If we are digging much hard mud, or if we happen to run into a bush, or something like that, it will be caught on this grate and put immediately on a slide or "bootjack" so that it doesn't get into the screen. Any material that passes on through what we call the harp goes immediately into the rotary screen.

The revolving cylindrical screen on this particular boat has a length of about 25 ft. It is a jacketed screen, as is of course common practice in that kind of an operation. As the material goes into the screen it is met by a large stream of water—a stream from a 10-in. pump. It is put through the screen.

On each side of the boat we have what you might call a sump. We call it simply a vat, a sand vat or a gravel vat. Each of the different materials passes to its respective vat. Passing through that vat there is a continuous stream of water running from the screen and also there are auxiliary pumps throwing more water in there, the object being of course to again wash the material. Any sediment in the vats, that is, the mud and silt, is stirred up continually by the elevator chains on the unloaders. The extra washing causes the silt to run overboard on each side of the boat.

For unloading or emptying the vats we have two other ladders or frames with strings of buckets. They are built substantially the same as the main ladder, except that the buckets are smaller. We have 51 of these buckets on one side and 50 on the other. They elevate the material and deposit it in the chutes, and it flows out on the sides of the boat.

We attach a barge on either side of the dredge; one barge catches the gravel and the other the sand. These barges are towed to established unloading stations on the river front. At our largest unloading point we use a whirler hoist and a 3-yd. clam-shell and place the material on cars or throw it into storage, as the case may be.

The principal thing about our plant, I believe, as compared with the ordinary pumping proposition, is that our whole operation, as far as manufacturing goes, is in one place. We take our manufacturing plant right with us. If on occasion we have to move up or down the river a considerable space that does not in any way affect our loading plant.

The most of our digging is from the side of islands. That means that the projecting end of our ladder is out beyond the end of the boat, so that we can go right into the side of the island and rip a hole in it and load the material.

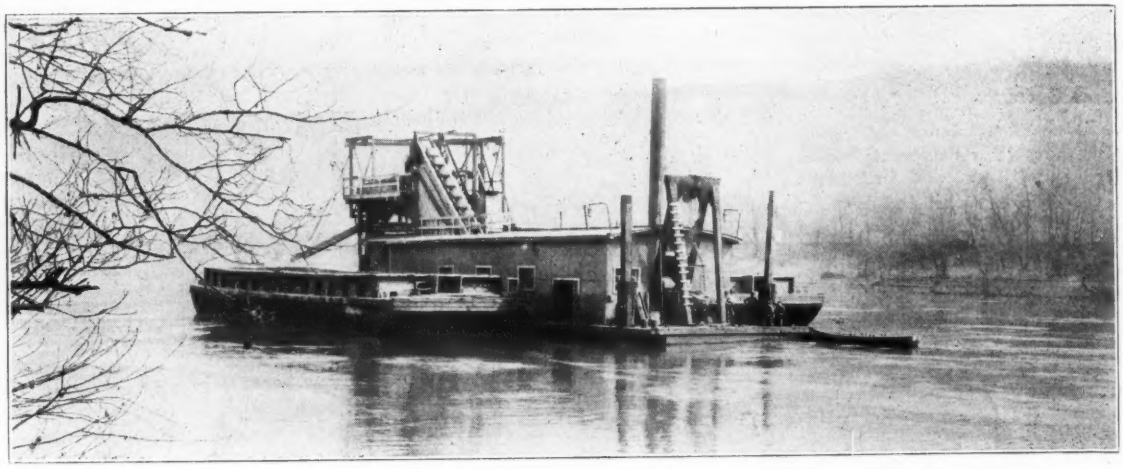
Two Types of Dredges

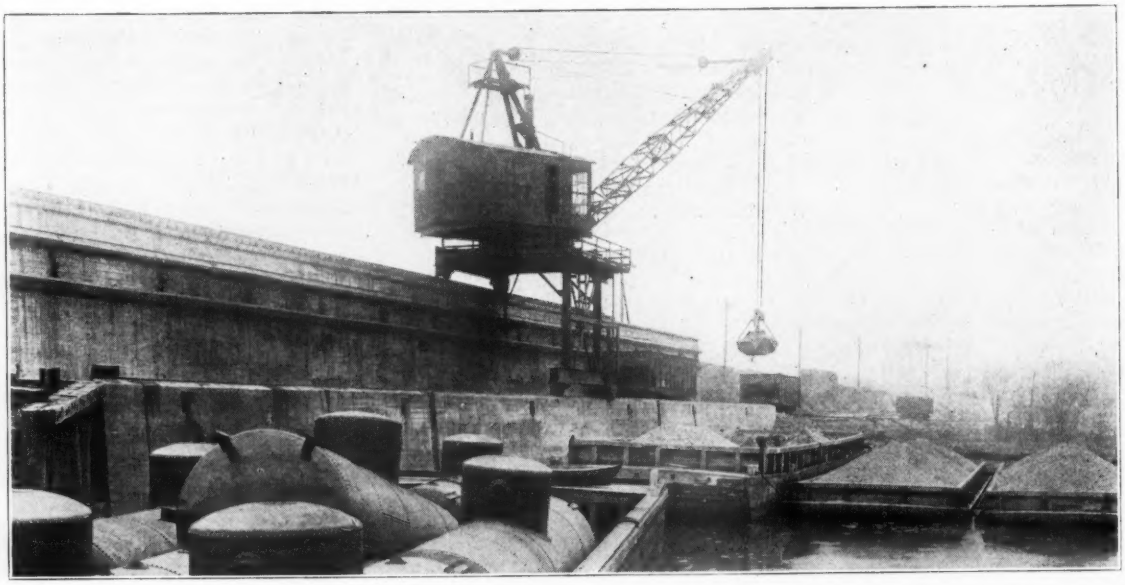
We have also another type of boat. The one described above is the low screen and the other is the high screen type. The low screen type dredge is desirable, as it keeps the center of gravity as low as possible so that the weight will not upset the boat. In the high screen type the digging chain is more nearly horizontal. The dump is lower. The material runs at once into a single sump. It is washed in this case before it is screened. The materials, after they have been washed and agitated in this sump or tank, are elevated by elevator buckets and then passed through the screen in the same way as before, except that we do not use a harp. They pass through the screen and there again they are washed by the water under pressure, getting the materials divided by the ordinary process, the sand going one way and the gravel the other. The sand passes to a sand vat where it is again washed and elevated to run out on a barge.

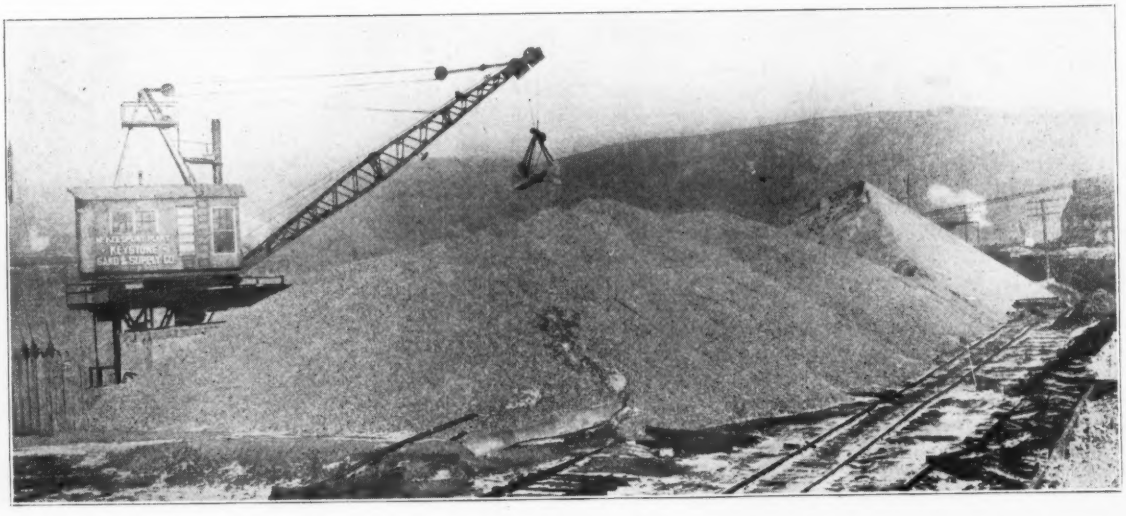
Power Consumption

This larger boat (No. 4) of which I have spoken, has a 150-h.p. steam engine. The best record we have for it is a period of a little bit over ten hours when we dug, washed, screened and loaded on

Type of barge unloading derrick for a car-loading or storage plant






KEYSTONE
CLAMSHELL

barges 4,250 tons. The ordinary capacity of this boat we call something around 300 tons an hour. The capacity of our other two diggers is approximately from 1,500 to 2,000 tons in ten hours.

This power consumption will compare, I believe, very favorably with the power used in any pumping proposition of the same size, when you stop to remember that a 150-h.p. engine not alone digs the material, but runs the pump for wash water, turns the screen, elevates the material, so that it runs out on the barges.

Steel Barges Best

Our company has adopted as standard practice the use of steel barges. We have some wooden barges left, but we are replacing them as rapidly as possible with steel barges. We use what we call the flush deck barge as against the hopper barge. The flush deck barge has this advantage that whatever water may come out with the sand or gravel runs off the deck through limber holes in what is known as cargo boxes; that is, just the box effect on top of the deck which holds the material.

We are through with that water and it doesn't interest us any more, whereas in the hopper type of barge the material is down below the surface of the water. The deck of the barge and the bottom of the barge are only 12 inches or so apart, and with the use of that type of barge a large expense is entailed for pumping the water out again. It seems better to let the water run off by gravity than it does to pump it out.

Best Quality and Size of Sand for Sand Blasting

Cleaning Metal Surfaces Before Painting Discussed by an Expert Locomotive Painter

By J. W. Gibbons*

EXPERIENCE having taught us that the sandblast is the most economical and thorough method of removing the flash scale corrosion and old paint from a metal surface, economy of operation has been the only thing considered, durability or cost of finishing the surface has been lost sight of, with the result that a surface which was practically impossible to preserve with paint, has frequently been obtained. This naturally raised a doubt in the minds of some as to the desirability of using a sandblast in preparing a metal surface for paint. Even in conventions of this association, the durability of paint applied over a sandblasted surface compared to a non-sandblasted surface has been questioned. This state of affairs has held particularly true with regard to steel roofs.

Quality of Sand

The above facts, no doubt, prompted the committee in their selection of the above question for discussion. In my opinion, the essentials necessary to secure good results from sandblasting metal preparatory to painting, are the quality and size of the sand pebbles and the velocity and volume of the projectiles thrown against the surface. As to quality, any sand that is hard and firm will answer. The less dust or dirt it contains the better from every point of view. As to the size of the sand pebbles, I submit the results secured with various sizes.

A steel plate sandblasted with sand run through a 4 by 4 mesh sieve (4 meshes to the linear inch) showed a torn condition of the metal; the pin points were numerous. When paint is applied over a surface like this and subjected to the attrition of wind, rain, sleet and cinders, incident to service conditions, the sharp projections puncture the paint film, allowing moisture to seep under the paint, carrying with it all the destructive agencies of the sulphurous products from coal burning locomotives or furnaces. Corrosion sets in, deteriorates and frequently destroys the metal before we realize that anything is wrong.

Best Size of Sand

A plate sandblasted with sand run through a 6 by 6 mesh sieve had practically as poor a surface to paint over as the first mentioned plate. Another plate was sandblasted with sand run through a 10 by 10 mesh sieve and a fourth plate was sandblasted with sand run through a 16 by 16 mesh sieve. Both of these have an ideal surface for paint with just sufficient roughness to give tooth to the paint and hold it firm and solid.

These plates were all cut from the same piece of sheet steel and sandblasted with the same quality of sand. The velocity and volume of projectiles were also the same on all plates, the only difference was in the size of the sand pebble and, in my opinion, proves that the size of pebble enters largely into the results obtained by sandblasting.

The second part of my claim, that the velocity and volume of the projectiles also are essential, may not be as susceptible of proof by photographs, but if you take a sheet of steel and throw a heavy volume of sand upon it with a high velocity, you will find that it will not only tear the metal, but will warp the sheet.

Market for Fine Sand

When we consider that sand run through a 16 by 16 mesh sieve will clean practically as much surface in a day as sand run through a 6 by 6 mesh, and that the only extra cost is in the time required to sift the sand and in the percent of sand available, and that this extra cost is more than made up in the time required to paint and surface up the metal, there can be no excuse for using a coarse grade of sand. As to velocity and volume of projectiles, in my judgment, the air pressure should be no less than 70 nor more than 90 lb., gage, and the size of nozzle should not be over ⅜ in. nor less than ¼ in. in diameter.

*Foreman Locomotive Painter, A. T. & S. F. R. R., Topeka, Kan., who delivered his paper before the Master Car and Locomotive Painters' Association, Chicago.

Indiana Association Obtains Modification of Gravel Specifications

THE INDIANA STATE HIGHWAY specifications for concrete aggregate to be used in one-course concrete roads called for the grading requirement of 30 to 70 per cent to be retained on a ¾-in. sieve. Two of the members of the Indiana Sand and Gravel Producers' Association gave notice that this specification would rule out their product, one because it required too coarse and the other one too fine. Both deposits were sampled by the State Highway Commission Testing Engineer at the request of the association, and tests made to determine the suitability of the material for concrete roads. As a result of the examination and tests, the Chief Engineer will recommend that the requirement on the ¾-in. sieve be omitted.

A Specification and Tests Committee, consisting of Messrs. Miller, Carmichael and Neville, has been appointed, together with the Secretary and Extension Engineer, to prepare for future tests and investigations. Tests to prove the fitness of the material of any of the members of the association will be conducted on request.

Principles and Practice of Air Separation

Pulverized Material as Fine as 350-Mesh Can Be Recovered by This Method—Limitations of Screening—New Use in Cleaning Rock Phosphate and Agricultural Limestone Dust

By S. B. Kanowitz

Engineer, Raymond Bros. Impact Pulverizer Co., Chicago, Ill.

IN THE GRINDING OR PULVERIZING of various materials most mills use some form of separator for obtaining a product of suitable fineness. This is accomplished by use of screens or by means of air currents.

Some pulverizers have a separator outside of and distinct from the mill proper, that is, the discharge of the mill goes by means of an elevator, or screw conveyor, to a separator where the fines are removed and the tailings, consisting of coarser particles with more or less of the fines, are returned to the mill for further grinding. In other types of

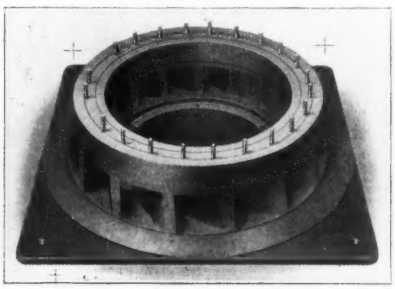


Fig. 1—Base casting of pulverizer of the Raymond mill

mills the separation is an inherent part of the mill, and no material leaves the mill until it has been ground to the proper fineness.

Definition of Fineness

When referring to the fineness to which a certain material is to be reduced there is often a misconception as to what the term really means. The term "mesh" is used freely, such as 60-mesh, 100-mesh, 200-mesh, etc., when designating a product required, without really meaning that 100 per cent of the material must pass the designated size of screen. What is really meant is that a high percentage of the product should pass through the given mesh, such as 80 per cent through 200-mesh, 95 per cent through a 100-mesh, and 99.6 per cent through a 60-mesh.

Even the term 95 per cent through 100-mesh has no absolute significance, since one might have two samples of material, each of which has been ground so that 95 per cent will pass a 100-mesh sieve, but one of which is so uniformly ground that all will pass a 50-mesh, while the other would have some particles left on a 35-mesh sieve.

This shows that it is necessary when stating the fineness required, to state also the size and percentage of the largest particles. For example, in specifying the fineness of ground rock phosphate, if expressed as 95 per cent through 100-mesh, the remaining 5 per cent should practically all pass a 60-mesh. Unless the character of the coarser particles is considered it is not possible to compare the same material ground and separated by different processes.

Limitations in Use of Screens

The use of screens or screening cloth for separation of fine materials is limited to a comparatively coarse product. When very fine separation is attempted the screens soon clog, decreasing the

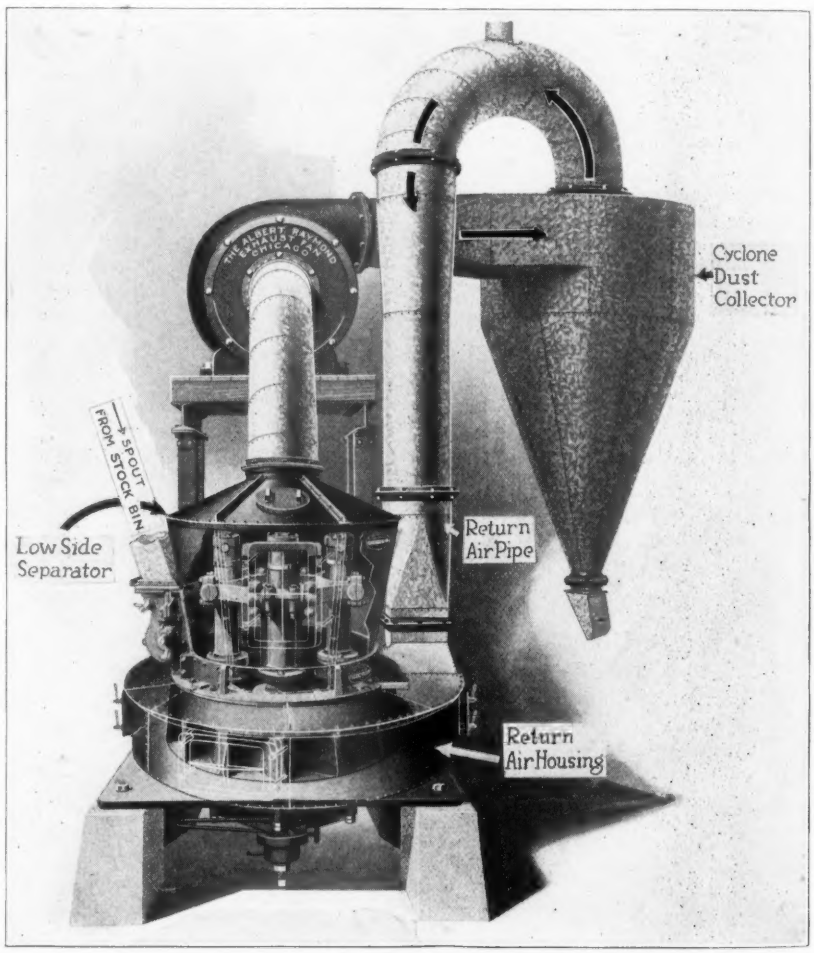


Fig. 2—Raymond system of pulverizing and air separation

capacity, and returning to the mill improperly cleaned tailings which contain a high percentage of fines, eventually choking the mill. When the tailings are rejected as in the case of hydrated lime, the attempt to make the separation by screens results in the loss of much of the hydrate. With hard abrasive material the screen openings are rapidly enlarged and soon give a product much coarser than desired.

Another disadvantage of screen separation of very fine materials is that an appreciable amount of moisture in the material will soon clog the screen openings, necessitating frequent cleaning.

Air Separation

To avoid the above faults and be able to obtain a fine uniform product air separation must be resorted to. By air separation we mean genuine air separation and not air conduction. There are processes which use air to handle the ground product. In some of these the material is sucked out by a fan and in others the discharge passes to a mechanical separator instead of to screens.

A real air separator should be an integral part of the mill. It should be able to remove the ground material from the grinding surfaces just as fast as it is made, thus preventing the mill from clogging. This increases the capacity of the mill, as it permits the rolls to grind on coarser particles. This can only be accomplished by having the air enter underneath the grinding surfaces and blow the ground particles up and away from the rolls.

The separator should be dustless in operation. It should be able to maintain a uniform product irrespective of changes in air velocity or air density met with under operating conditions. Should it become necessary to change the fineness of the finished product, it should be so designed that this can be accomplished in a short time and without shutting down the equipment.

The Raymond System

Fig. 1 shows air inlet ports beneath the grinding chamber of a Raymond mill. Fig. 2 shows a view of a typical installation, a cross-section of which is shown in Fig. 3. In Fig. 2 it will be noted that after the material has been ground and separated it is drawn into the fan and then blown into a cyclone dust collector. The material after traveling in the comparatively small sectioned discharge pipe enters the large sectioned collector and is compelled to travel in a circular path; the centrifugal force thus produced causes the material to hug the walls of the collector and eventually drop through the bottom as finished product. The air being freed from the material passes up through the top of the collector into the return air pipe, which delivers the air back to the portholes under the grinding chamber, shown in Fig. 1. These ports are surrounded with an air-tight casing, as shown in Fig. 2.

Just as soon as the rolls pass over the material the air takes it away, lifting it up, at the same time imparting to the material a **whirling or circular** motio As the material passes up with its cyclonic motion, the whirling currents travel in a larger and larger circular path, due to the increased radius of the separator, the coarser particles, due to the action of centrifugal force, are constantly being thrown against the sides of the separator and drop back to the mill to be reground, while the finer particles upon which the centrifugal force is not great enough to overcome the fan suction, pass into fan intake.

This type of separation is used with what is known as the low side mill (Fig. 3). It is adapted for medium grinding, that is, for material ground so that 85 to 95 per cent passes through a 100-mesh sieve. It will be noticed that the separation obtained is not done by changing the air velocity or air density, but by imparting a circular motion to the particles, lifting them up with a cyclonic motion, and as the separator increases in diameter and the air increases in rarity the coarser particles keep on dropping back to be reground. We can thus safely use a high air velocity and lift up both coarse and fine, keeping the grinding surfaces free from fines and gradually, due to the cyclonic motion of the particles, separate the fine from the coarse and throw the coarse out of the air currents back to be reground.

For Very Fine Separation

When a still finer product is required, or where it is desirable to frequently change the fineness, the high side mill is used. The grinding mechanism of a high side mill is identical to that of a low side mill, the only difference being that in a high side mill a double cone separator is used, while in a low side mill the single cone is used. The material is ground and removed from grinding surfaces in a similar manner in both mills.

In the high side mill the material, after being subjected to the same mode of separation as in the low side mill, receives a further separation by passing the material up between two cones and into an inner cone where it receives any degree of separation desirable. Fig. 4 shows the high side mill.

The material after passing up between the two cones passes into the inner cone through ports on the inside of which are fastened deflector vanes. The double cone separator with the ports and deflector vanes is shown in Fig. 5. The deflector vanes can be rotated by means of a dial on top of the separator so that the angle of ingress of material can be varied. This angle can be changed through

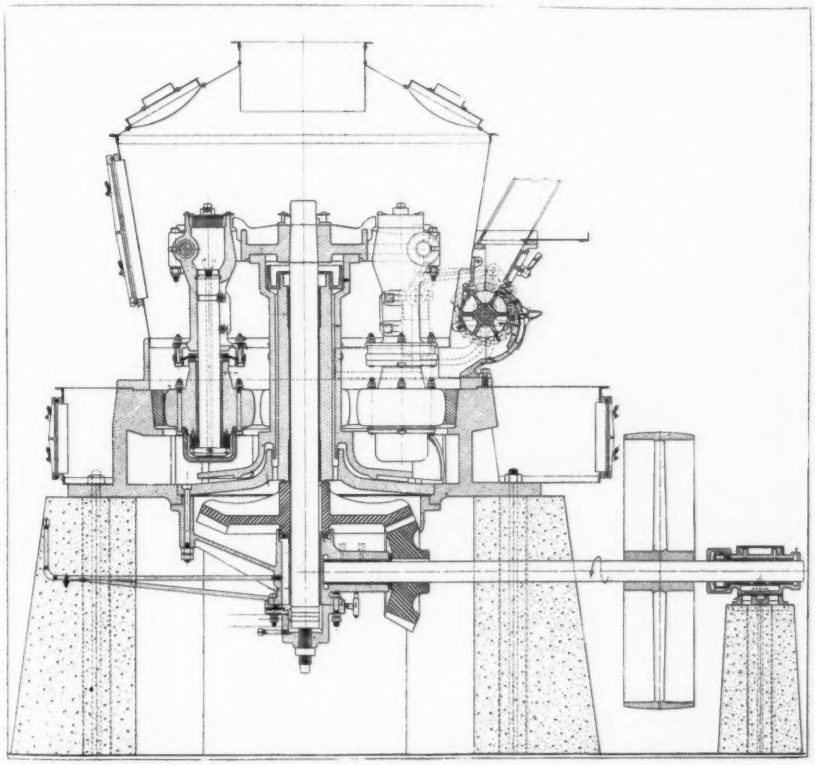


Fig. 3—Cross-section of the Raymond mill and connections

minute degrees from a radial position (pointing straight towards fan intake) to an extreme tangential position.

When the material enters the inner cone a certain per cent of the larger particles will drop out of the air current, due to the expansion of the air within the inner cone. As we wish to increase the fineness of the finished product we set the deflectors so that the materials enter the inner cone at an angle. This will cause the material to travel in a circular path, producing a further cyclonic action, more and more particles will be thrown out of the air current, against the inner cone and drop back through flap valves to the mill to be reground. The mechanism of this is shown in Fig. 4.

If a finer product is desired, the angular position of the deflectors is increased, which increases the cyclonic action, and the material is forced to travel in a path farther and farther away from the fan intake so that the centrifugal force acting on the particles continues to overbalance the suction force of the fan, thus making more and more particles drop out; the finished product becomes finer and finer until when the deflectors reach their extreme tangential position so much material will be thrown out that the material entering the fan intake will be exceedingly fine.

The position of the deflectors can be changed by the operator in a very short time, while the mill is running, and any degree of fineness obtained without losing any time due to a shutdown.

The operator soon finds out what position of deflectors will give the required fineness for any particular material. Having once found the required position for a certain material he can indefinitely leave the deflectors in that position, the separator will automatically take care of his fineness. The only time he will have to change position of the deflectors will be when he changes from one material to another having different physical characteristics.

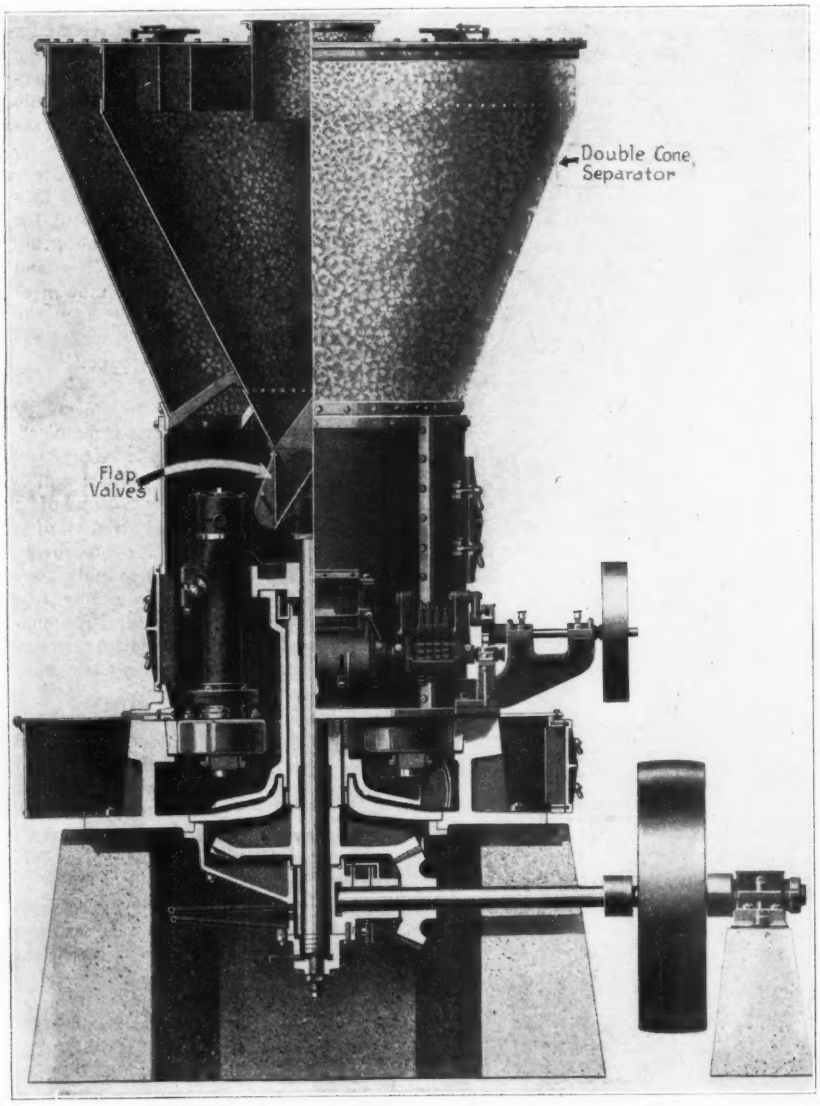


Fig. 4—High-side mill and double-cone separator

Theory of Air Separation

From what has been written above, it will be seen that the fineness of finished product depends upon the centrifugal force acting on the particles and also on the rarity of the air. The greater the centrifugal force, the finer will be the finished product, since the greater this force the more particles will be rejected. The rarer the air the finer will be the finished product, since, as the vacuum in inner cone increases the buoyancy of the air decreases and so loses its carrying capacity.

We will now assume that the material in the inner cone is revolving, due to the cyclonic action produced by the high air velocity. Each particle is acted on by two forces, the centrifugal force due to the velocity of its rotation and by the central radial force due to the fan suction. Those particles which are so small that the central force overbalances the centrifugal force will enter the fan intake and be delivered as the finished product. The other particles will be thrown out of the air current back to the mill.

We will now assume that for some reason or other the speed of fan is increased. This would tend to increase the carrying properties of the air and in some systems coarser particles would be lifted and delivered with the finished product, changing the uniformity of the product. In the Raymond system, however, just as soon as the increase in air velocity takes place, lifting up more and more coarse, there is a corresponding increase in the centrifugal force acting on the particles, since centrifugal force increases with an increase of velocity, throwing the particles back again. We thus see that an increase in air velocity tending to change the uniformity of finished product is counterbalanced by the increased centrifugal force, and the equilibrium of the operation is maintained. Or vice versa, a decrease in air velocity, decreases the carrying power of the air, tending to increase the fineness, but a decrease in air velocity decreases the centrifugal forces acting on the particles and the equilibrium is again maintained.

We can now readily see how important it is to use a high air velocity in order to be able to produce an appreciable centrifugal force acting on the product, which gives a fine product and at the same time maintains its uniformity. When we also consider the small size of the particles dealt with the importance of high velocity becomes more apparent.

This velocity must be of such intensity and under such control that its centrifugal action on the particles can be so regulated as to separate particles whose difference in weight is less than one-thousandth of a milligram.

Applications of Air Separation

In the industrial field air separation has replaced all other methods where an extremely fine product is required, for it gives a much larger capacity than is possible by screening or bolting. In fact, the fineness of the finished product attainable by air separation is practically unlimited. A finer product can be obtained than from the finest silk bolting cloth, and at a fraction of the cost. The fineness of some materials that are being commercially separated today is greater than can be indicated by the finest testing sieves it is possible to make. When one realizes that there are screens on the market of 350 meshes to the linear inch, or 122,500 holes per square inch, some inkling is had of the fineness that can be attained in an air-separated product. The fineness of such materials can only be determined by a microscope and the mesh of the particles estimated.

Sticky materials, or materials that become sticky when handled can be readily obtained by air separation; such materials are resin, pitch, shellac and various gums used in making varnishes.

For pulverizing limestone, calcite, talc and other rocks and minerals for paint fillers, etc., air separation is the only practicable means, since the commercial requirements of such materials generally call for 200-mesh stuff or better. Many such products are ground to 350-mesh.

The use of air separation in conjunction with the pulverization of coal has given great impetus to the application of pulverized coal in many types of furnaces, particularly in the case of open-hearth steel furnaces. Although the requirements of a rotary cement or lime kiln do not call for a finely pulverized fuel, it has been proved that a purer product can be calcined because of the complete combustion and the absence of ash in the product, when using a 200-mesh fuel.

For Removing Impurities in Ground Rock Phosphate and Agricultural Limestone

One unique feature of air separation is its use with a pulverizer when grinding materials containing impurities, which have grinding characteristics different from the material it is desired to save or collect. Thus in the pulverization of clays containing a certain amount of sand or grit it is possible by air separation to pulverize and remove the clay and throw out the sand or grit automatically. This is the common process in the hydrated lime industry, which is one of the largest applications of the method.

About the latest application of air separation has been in the phosphate fields of Tennessee and Florida. Here the rock is not only pulverized and separated in an extremely fine state, but it must be cleaned of impurities. This is accomplished by means of an automatic throwout, as will be explained. Of course the same process may be, and in fact is, being applied to clean fine limestone dust of similar impurities.

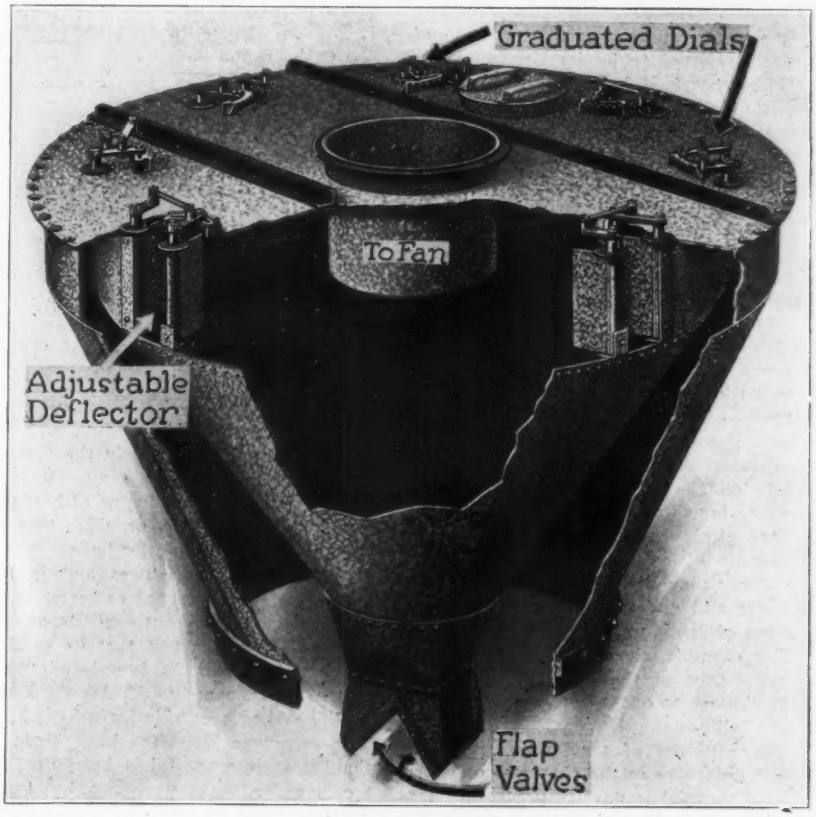
Certain Tennessee phosphate rock consists of disintegrated phosphatic sand mechanically combined with clay, which naturally lowers the percentage of tricalcium phosphate, the valuable constituent. The ordinary process is to wash out the clay by hydraulic separation. There are some cases, however, where it does not pay to use a washer, particularly when the phosphate rock itself is in a very fine state, or when the rock is to be pulverized for direct application to the soil, without further refinement. In the latter case the clay is pulverized and carried off in the air current while the phosphate particles are separated and saved. This is accomplished with the double-cone mill, in which the phosphate dust is collected and removed by the inner cone.

Florida soft phosphate, which is now being pulverized to a considerable extent for direct application to the soil and also as a filler for acid phosphate, contains in many cases a high percentage of free silica sand. By the same means already explained, air separation makes it possible to remove the sand and concentrate the phosphate dust.

Texas Potash Development Waits Protective Tariff

DALLAS, Texas—The development of vast potash deposits in the eastern part of Terry County, in the South Plains country of western Texas, is awaiting the adoption of a protective tariff by Congress on the American product, according to O. T. Halley, cashier of the Brownfield State Bank of Brownfield. While in Dallas this week, Mr. Halley said that all the known deposits have been leased and the ground purchased for a factory in Brownfield. The water containing the potash and other salts will be carried in wooden pipes from the potash lakes to Brownfield.

The deposits of potash are said to be the largest and to have the highest percentage of marketable fertilizer in the United States. Investigations have been conducted by Federal representatives and a protective tariff recommended.



Details of double-cone separator showing method of changing the fineness of finished product

Diatomaceous (Infusorial) Earth-Occurrence and Uses

Common but Little Known Rock Product Which Has a Growing Importance in Industry

By W. C. Phalen
Mineral Technologist, U. S. Bureau of Mines

THE BUREAU OF MINES is in frequent receipt of inquiries relating to various classes of abrasive materials, among them diatomaceous earth. This brief paper has been prepared with the view of placing on record in available form information with reference to this rather abundant and useful material. Another reason for its preparation is the fact that it does not appear to be well known that diatomaceous earth is rather widespread in its occurrence; is not confined to the western part of the United States, especially California, but is well distributed in many eastern states, where the demand should be greatest owing to the larger number of industrial operations requiring abrasive materials of all kinds.

Definition

Diatomaceous earth is more commonly known as infusorial earth, and is sometimes referred to by its German name, "kieselguhr." It is also, though erroneously, called tripoli. It is composed of the siliceous remains of minute aquatic plants known as diatoms, which are of minute proportions, as a general rule, and have to be identified chiefly by aid of the microscope. The organic matter of these plants has long since disappeared from most of the deposits, but there are notable exceptions, as in California.

These low forms of plant life secrete silica much after the same manner as mollusks secrete lime, and thus build up their shells. It is this part of the plant which makes up the formations found in nature. The siliceous parts accumulate on the bottoms of the bodies of water in which the plants lived, and in time attain considerable thickness and become of economic importance. The diatoms may live in either fresh or salt water and under widely varying conditions of depth, pressure and temperature. For example, they have been found in the depths of the Atlantic Ocean and are known to occur in the warm springs of Yellowstone National Park, to cite two extremes of temperature, pressure and difference in the character of water. The material is now in process of formation and although it has in times past been formed in very different epochs, it is especially abundant in the Tertiary and most of the known beds of great thickness are of this age.

Chemical Composition

In chemical composition diatomaceous earth is a hydrous silica or opal, but as a rule it contains a considerable quantity of earthly impurities. A very simple test, taken in connection with other distinguishing characteristics, is that when touched with hydrochloric acid it does not effervesce. Sometimes analyses from widely separated localities show great similarity of composition; as, for example, the first three analyses below:

	1	2	3	4	5	6	7	8
Silica (SiO_2)	80.53	80.66	81.53	75.68	65.62	86.92	72.50	86.89
Alumina (Al_2O_3)	5.89	3.84	3.43	9.88	.....	4.27	11.71	2.32
Iron Oxide (Fe_2O_3)	1.03	.....	3.34	2.92	.....	.....	2.35	1.28
Lime (CaO)	0.35	0.58	2.61	.29	.....	1.60	0.32	0.43
Magnesia (MgO)	.....	.....	.....	0.69	.....	Trace	0.83	Trace
Potash (K_2O)	.....	.....	1.16	0.02	.....	2.48	1.88	3.58
Soda (Na_2O)	.....	.....	1.43	0.08	.....	.....	.....	.....
Water (H_2O)	*12.03	*14.01	*6.04	.....	11.00	5.13	9.54	4.89
Nitrogeneous Matter and Moisture	.....	.....	.....	9.21	.....	.....	.....	.....
	99.83	99.09	99.54	98.77		100.40	99.13	99.39

*Water and organic matter.
1. Lake Umbagog, New Hampshire.
2. Morris County, New Jersey.
3. Pope's Creek, Md.
(Note: The above three analyses are quoted from Merrill, G. P., The Nonmetallic Minerals, 2d Edition, 1910, p. 72.)
4. Darton, N. H., U. S. Geol. Sur. Bull. 483, page 27, 1911.
5. Soft Diatomaceous Shale, Harris, Santa Barbara Co., Calif., W. T. Schaller, Analyst.
6. Porcelain diatomaceous earth, Pt. Sal, Santa Barbara Co., Calif., Fairbanks, H. W., Bull. Dept. Geol. Sur., Univ. Calif. Vol. II, 1896, p. 12, Sp. Gr. 2.12.
7. Soft diatomaceous shale, Orcutt, Santa Barbara County, Calif., W. T. Schaller, Analyst, 1908.
8. Monterey, Monterey Co., Calif., A. C. Lawson and J. de la C. Posada, Dept. Geol. Univ. Calif., Vol. 1, p. 25, Sp. Gr. 1.8 to 2.1.

Uses of the Material

The chief use of diatomaceous earth is as a cleanser and polisher, and for these purposes it is used in the form a powder or mixed with soap. It is a most effective non-conductor of heat and has been used alone or with various compounds in covering for boilers, steam pipes, furnaces and stoves and in the manufacture of fireproof cements.

It has great absorbent qualities, as will be noted from the fact that its specific gravity, bulk for bulk, is only one-third that of water, namely 0.33. Its absorbent quality makes it suitable for water filters. The statement has often been made in the literature that it has been used in the manufacture of dynamite, but I understand that its use for this purpose has long since been entirely supplanted by wood pulp on account of the danger from particles of grit. Boiled with shellac it is used in the manufacture of records for talking machines.

Its uses abroad have been more numerous than in the United States. It has been used in Europe for the absorption of liquid manures so as to make the latter conveniently available as a fertilizer. It has also been used in the manufacture of water glass, in making cement, in tile glazing, artificial stone, ultramarine and other pigments of aniline and alizarine colors, paper filling, sealing wax, fireworks, hard rubber objects, matches, papier mache, as a container for liquid bromine and for miscellaneous minor purposes.

In California it has been used in the construction of buildings, advantage being taken of its property of being readily cut into any desired shape or size. In some of the California reports it is referred to as shale. It is easily quarried and the small blocks into which it may be cut are light in weight and placed easily in position.

A number of buildings have been successfully constructed of this material in the Lompoc district, Santa Barbara County, California. The blocks are compact and elastic under temperature changes and appear to possess sufficient strength. They are, moreover, very resistant to weathering on account of the insolubility of their chief constituent, silica. Such building material appears to be especially well adapted to regions of earthquakes or tremors, owing to the probable lesser effect of shock on such a light substance and the minimum amount of damage and danger resulting from its fall. In powdered form the material has

been used to a certain extent in California in the manufacture of plaster.

Preparation of Material

In preparing the earth for industrial use it is first roasted to expel as much water and organic matter as possible. It is then transferred to a furnace and heated to a moderately high temperature but with the exercise of sufficient care so as not to destroy its porosity by overheating. It is then finely ground between rollers, sifted and sacked to prevent reabsorption of moisture. For certain purposes it is only necessary to give it a prolonged drying at a high temperature prior to grinding and sifting.

In Santa Barbara County, California, the material is broken in quarries and as mined contains a considerable percentage of moisture. After 40 to 50 days of drying in the dry atmosphere of southern California the material still contains a small percentage, approximately 5 per cent, of moisture. Some of the material after air-drying is sawed into bricks or other shapes and dried in kilns. Such bricks are used for insulating purposes. The rest of the material is finely powdered in mills and sacked, to be used for filtering. Quarrying is done by electrically driven channelling machines. Some of the California material contains 5 per cent of alumina, presumably in the form of clay, which acts as a binder. This material is adapted to the use of building blocks for interior fireproof walls and contains about 85 per cent silica.

One of the deposits near Lompoc, that of the Celite Products Co., formerly the Kieselguhr Co. of America, comprises extensive beds of soft white earth in a very pure state, both thin and massive. These form a cap over the hills and overlie brown siliceous shales and are conformable with them. The strike is east and west and the dip is 30° south. This material is being quarried in open cuts. It is taken up in large blocks and air-dried in the quarry. It takes from 40 to 50 days to reduce the water content, which ranges from 25 to 45 per cent by weight, to 5 per cent. It is then hauled by motor trucks to the plant at Lompoc, where it is ground to powder and transferred to the different warehouses by a pneumatic system. When blocks are required the material is transported in its natural state direct from the quarry, sawed to the required sizes and dried before shipment. The material, when dried is utilized in making brick, tile and other refractory materials.

The quarry operations are readily carried out where transverse joints occur in the strata, due to earth movements. Where these are not present to facilitate removal of the rock it is necessary to loosen it slightly by means of powder before blocks can be removed from the quarry face.

On account of the quantity of absorbed surface water in the diatomaceous earth, it is necessary that it be split into convenient blocks for drying.

Deposits in the United States

That infusorial earth is a widely distributed commodity in the United States is evident from the descriptions given below. The localities outlined are doubtless far from being a complete list. They are given principally to indicate the widespread occurrence of the material.

MAINE: A deposit of diatomaceous (infusorial) earth of unknown extent is reported to have been worked in South Beddington, Washington County. The material is said to be of pure white color.

NEW HAMPSHIRE: Beds of diatomaceous earth are reported from the vicinity of Lake Umbagog. An analysis of this material is given above.

MASSACHUSETTS: Beds of infusorial earth are said to occur near South Framingham.

NEW YORK: Two deposits of infusorial earth are known in the State of New York, namely at White Lake, Herkimer County, and at Cold Spring Harbor on Long Island. It is likely that careful prospecting will reveal other deposits in some of the larger peat bogs and marshes of the State.*

NEW JERSEY: Near Drakesville there occurs a deposit which covers a small acreage to a depth of 1 to 3 ft.

MARYLAND: Infusorial earth has been mined along Lyons Creek, a branch of the Patapsco River, separating Calvert and Anne Arundel Counties. The location is 5 miles west of Herring Bay, on the west shore of Chesapeake Bay. Deposits are also known extending from Fairhaven on Herring Bay to Pope Creek on the Potomac River. It occurs at the base of the Calvert formation, which is Miocene (Tertiary).

VIRGINIA: Diatomaceous earth occurs also in the Calvert formation of the Chesapeake group in the vicinity of Richmond, Va. The lower beds of the formation, chiefly those between 5 to 20 feet from the base, contain diatom remains in sufficient quantity to entitle it to be termed diatomaceous earth. In weathering, the portions rich in diatom remains become nearly pure white. The material is of very fine texture, and is very light grey to white in color. Its lightness is characteristic, having a specific gravity of only 0.33, bulk for bulk. It outcrops especially in the valley of Shockoe Creek. The available material here is not so great in extent as at some other localities in Virginia and Maryland. The purer deposits are soft and clay like, and when dug are very porous, with a white or slightly yellowish tinge.

FLORIDA: The Florida deposits of diatomaceous earth have been formed in fresh water, and are of comparatively recent date. A deposit located at Eustis, which has been worked to some extent, is in general appearance very much like the peat bogs of that section. The diatomaceous earth is in fact intimately mixed with peat or muck, and the material as taken from the bogs looks like peat of a grayish color. The method of treatment is to burn out the carbonaceous matter. Leaving the siliceous material as a very fine white powder. The deposit in this bog has a thickness of 20 ft. or more.

About 3 miles east of Tavares, on the north side of Lake Dora, is a bog of the peat prairie type covering 100 acres. In 1901 a plant to treat the infusorial earth was erected on the north edge of this prairie, a few hundred feet from the Sanford and Eustis division of what is now the Atlantic and Coast Line railroad. The peat was dug by hand to a depth of about one foot, conveyed mechanically up an incline to the top of a building, and there dumped into a machine which pressed out the bulk of the water. From here it was taken to a shed, spread out to dry, and afterward burned in a suitable furnace. It is reported that the product was at first shipped to England for use in the manufacture of scouring soap.

Besides the occurrence near Eustis, Lake County, a number of samples of similar material have come from Polk County.

NEW MEXICO: Near Socorro, New Mexico, there is stated to be a deposit of fine quality which outcrops in one place 1,500 ft. long and with a thickness of 6 ft.

NEVADA: A deposit of diatomaceous earth is reported in a railroad cut west of Reno, Nevada, with a thickness not less than 300 ft., and varying from a pure white to a pale buff or canary color.

OREGON: Near Linkville, Klamath County, Oregon, there occurs a deposit of infusorial earth which has been traced a distance of 10 miles; and along Lost River, it shows a thickness of 40 ft.

IDAHO: Beds of diatomaceous earth are known to occur in Idaho.

WASHINGTON: Beds of diatomaceous earth are known to occur near Seattle.

CALIFORNIA: There are a number of deposits of infusorial earth in California. The most important thus far developed are in Santa Barbara, Monterey, Orange and San Luis Obispo counties. The material in Santa Barbara County is of superior quality and

*Parsons, A. L.: Peat, its formation, uses, and occurrence in New York, 57th Ann. Rept., N. Y. State Museum, Vol. 1, Sec. 1 (or 23d Ann. Rept. State Geologist, Part 1); 15-80-1905.

has been worked on a commercial scale. Infusorial earth is also found in Fresno, Kern, Los Angeles, Plumas, San Benito, San Bernardino, San Joaquin, Shasta, Sonoma, and Tehama counties. During 1918 five quarries operating in Monterey and Santa Barbara counties produced a total of 36,000 tons of this material, valued at $190,000. The most important deposit is that of the Celite Products Co., formerly the Kieselguhr Company of America, the name having been changed during the war. The quarry and mill of this company are at Lompoc, Santa Barbara County. This company has rapidly increased the scope of its dust operations, and it is reported that it expects to still further increase them. There is still another operation in the same vicinity by the name of La Salle Canyon quarry. Near Bradley, in Monterey County, there have been two small operations, and possibly a third. The deposits of northern Santa Barbara County have been described in great detail, and their areal extent indicated in a bulletin by Ralph Arnold and Robert Anderson.*—Bureau of Mines, Reports of Investigations.

Use of Talc in Paint

Pulverized Talc Extensively Used as Paint Filler—No Longer Considered an Adulterant—Has Distinct Value

By Raymond B. Ladoo, U. S. Bureau of Mines

TALC HAS BEEN USED for a number of years as a filler or extender in the manufacture of mixed or ready-prepared paints. At first it was done secretively and regarded as an adulterant; but gradually it was found, by actual tests and impartial research, that talc has certain valuable properties which really improved paints used for some purposes. Today talc is regarded by expert paint chemists as a standard paint material of great value.

The standard works on the chemistry and technology of paint materials and mixed paints present photo-micrographs of various forms of ground talc, offered for sale to the paint trade, which illustrate one of the reasons why talc has not always been favorably regarded in the past. Some of the essentials of a mineral filler for paints are fineness, good color, freedom from grit, and uniformity. All material should pass a 200-mesh screen and better, a 300 or 350-mesh screen. In these photomicrographs it is clearly demonstrated that much of the talc formerly on the market was not uniform in size and some of it was coarser than 200-mesh. In comparison with many other materials illustrated it was a coarser product. As a result of this improper preparation and some undeserved criticism, prejudice was created which has been difficult to overcome. Today talcs in some localities are being prepared very carefully; they are uniform, fine in grain, and far superior to the former products. Air floated talc, properly milled, should be, and is a material admirably adapted for use as a filler or extender for some classes of paints.

To the paint trade talc has been known variously as asbestine (fibrous talc from New York), talcose, soapstone, and talc. This difference in nomenclature has not, in general, been helpful to the talc industry. While talcs from various localities exhibit differences, both physical and chemical, they are all talc and if properly prepared should be suitable for the same or similar uses. When ground to 200 mesh or finer the differences in shape of grains become very small, and this difference between fibrous and foliated or massive talc becomes less important. It has been claimed that massive talc was not suitable for paint manufacture, but this is probably very questionable.

Theoretically a talc which has a tendency to grind into small flat grains or flakes should be superior to that which tends to produce fibers, when used in a mixed paint. This is due to the fact that a flake has a larger surface per unit of weight than a fiber and is thus more easily held in suspension, and to the fact that the covering power of flakes per unit of weight is larger than that of fibers, due also to the greater surface exposed. Talcs from all producing districts should be carefully examined and tested by disinterested research laboratories in order to demonstrate their suitability for this use. It has been stated that talc forms one of the best paint fillers now available. In view of the present abnormal demand for all pigments and the inadequate supply of same, the subject is worthy of the careful attention of all talc producers.

The properties of talc as used in paint have been described by Gardner.* "This pigment comes in two forms: as asbestine and as talcose (talc, etc.). The former is very fibrous in nature and is a very stable pigment to use in the manufacture of paint, on account of its inert nature and tendency to hold up heavier pigments, and prevent settling. It also has the property of strengthening a paint coat in which it is used. The talcose variety is very tabular in form. Both varieties are transparent in oil, and very inert. They have a gravity of about 2.7 and grind in about 32 per cent of oil."

A series of paint tests is described by this same author in the work quoted, in which 47 paint formulas were used on test panels. After three years of exposure these panels were examined and it was found that among those giving good results were two which contained 26 per cent and 10 per cent of talc respectively. The first paint was composed of 22 per cent basic carbonate white lead, 50 per cent zinc oxide, 2 per cent calcium carbonate and 26 per cent talc; the second 27 per cent zinc oxide, 60 per cent basic sulfate white lead, 3 per cent calcium carbonate and 10 per cent talc. This series of tests proved conclusively that a combination paint made from two or more pigments, with a moderate amount of an inert filler such as talc, was superior to a single pigment paint. Other tests reported showed that 10 to 25 per cent of talc mixed with other pigments produced a good paint. These tests should definitely disprove the argument that talc is merely an adulterant iu paint.—U. S. Bureau of Mines, Reports of Investigations.

*Bull. U. S. Geol. Sur. No. 315, 1906, Part 1, pages 438-447.

*Paint Technology and Tests, H. A. Gardner, p. 55.

Asbestos in Apache County, Arizona

AN ASBESTOS CLAIM has recently been located in Apache County, Arizona. The deposit is said to be extensive, having been traced over 20 miles. Vein exposures are so prominent that, according to report, one can, without the aid of miner's tools, pick up a ton or more of crude asbestos that has broken down from the exposures. Material from the deposit, examined at the United States Bureau of Mines, is of the typical Arizona type. It is strong, flexible, silky, and occurs in cross-fiber veins.

The deposit occurs on an Indian reservation, and unfortunately the present law does not permit the development of asbestos deposits on unallotted Indian lands. The Office of Indian Affairs, through the Secretary of the Interior, recommended that authority be granted to develop unallotted Indian lands for the purpose of mining asbestos, coal, oil and gas, as well as metalliferous minerals, but favorable action was not taken thereon by Congress. In view of the present shortage of crude asbestos fiber it is to be regretted that mining work cannot be undertaken on deposits such as that described above.—Oliver Bowles, in "Monthly Reports of Investigations," U. S. Bureau of Mines.

Local Sales Organizations of Agricultural Lime Producers

County Farm Agent Outlines Methods Whereby Producers May Actively Push Sales by Employment of a Group Sales Manager

By Clarke A. Richards
North Vernon, Indiana

A YEAR AGO ROCK PRODUCTS published a special issue containing among other good articles a considerable number of constructive suggestions and comments on the agricultural lime and limestone industry. The best arguments were contained in the resume of the expert opinions of 28 prominent producers of agricultural lime and limestone who represented a production of 1,500,000 tons per annum.

To quote from this article: "Nearly all the producers recognize the importance of the local association, and all but three of those who favor national association favor a local association also. In fact, all producers who do not believe in a national association, with the exception of two, are unqualifiedly in favor of local associations. One large producer who has had much experience in association work believes there should be a 'national organization to promote general interests' and a 'local organization to promote sales'."

The following prospectus is for a local sales association to work in conjunction and co-operate with the national promotional organizations.

Need of Local Sales Organizations

Advertising material from 109 manufacturers of agricultural lime and limestone have been received at this office in the last few weeks. Some of this material is splendid—masterful; some is weak, the producers themselves frankly admitting in their letters their inability to sell even a major proportion of their capacities.

It seems there is a needless duplication of effort in this advertising matter, a duplication of effort for which the farmer feels he is paying every time the price of limestone is boosted. Surely there must be means of getting the message across to the farmer efficiently but in an economical way.

Much of the material is written in the concise, brief business style of the efficient factory manager, but very little of it, in fact, has an appeal to that peculiar genus homo, the American Farmer. The psychology of selling a suspicious farmer is in a class by itself, especially true of selling him something without which he can possibly exist.

Method of Operation

It appears that what many of these manufacturers of agricultural limestone lack—as shown by their advertising material—is a man who can sympathize with the farmer, a man who understands him, a man who knows the problems both from a physical and financial standpoint. It appears that this man should be an agriculturist who has intimate knowledge of chemistry, tact and organizing ability. He should know limestone and its uses and be able to appeal to the farmers in the farmers' own language and manner; sticking everlastingly at it and maintaining an enthusiastic and energetic follow-up.

Many of the larger companies have had such men in their employ for years to co-operate with their sales managers. But the smaller companies, and of course they form a large percentage of the total number of companies and put out an enormous tonnage of agricultural limestone, can ill afford such a man individually. But it is feasible for a group of these smaller companies to organize and hire such an agriculturist-manager for their association.

The larger state and national organizations are too unwieldy. Their primary purpose is to secure cost data, handle the car situation and to accomplish divers other important promotional projects. The purpose of these small organizations is but one—namely, the sale of agricultural limestone.

The territory covered should necessarily be small, not over the size of a state like Indiana. Each company submits bids of their prices per ton of agricultural limestone delivered into counties within economical shippng distance. The agriculturist-sales manager can submit a compendium of these bids to every member, who has the privilege of raising or lowering his bid in any county or town at any time.

The manager then has a working basis. He can get in touch with farmers and county agricultural agents, quoting the rock bottom prices for that particular county. Individual companies will continue doing business outside the organization in their present manner, but not at cut-throat prices.

When any company's output is sold the next higher bid is quoted for that county and in case two or more companies have the same bid for a county the orders are given in turn as received, the element of time of delivery to be taken into consideration. Care should be taken not to organize such a sales association in any one section where competition is keen, but rather among further removed non-competitors.

The cost of the manager's salary and expenses should be met by regular monthly assessments on each member and a percentage on the tonnage sold

Editor's Note

THIS EXCEEDINGLY INTERESTING and valuable article is contributed by a man who is fully capable of dealing with his subject. Perhaps this is best exemplified in his own words in a letter to the editor, in which he states:

"My brother and I own a farm in southern Indiana. We were among the first to ever use limestone on the fields. We have been heavy users ever since. I moved to this county as county agricultural agent three years ago. Limestone is the limiting factor here. There was but little used then, but intensive campaigns of the first year caused more to be used than any county in the state, the total reaching to the thousands of tons, and had this amount been shipped in instead of being ground by locally owned portable pulvers among the farmers it would have required a freight train five miles long.

"The excessively high price for farm help is causing me to advocate that limestone be shipped in from now on. I find it is difficult to start my campaign along this line now. We county agents are receiving no co-operation from producers whose business we are really stimulating in our campaigns. I have gone into this very thoroughly in the article I have prepared."

through the association sales service, thus giving an impetus to greater endeavor.

Work of the Manager

First: To sell agricultural limestone. Second: To stimulate future sales by the following:

(a) Endeavor to lessen the growing conviction among farmers that agricultural limestone companies are receiving an unfair profit.

(b) Start movement in favor of limestone filler, or carrier in commercial fertilizers instead of sand, peat, muck, cinders, etc.

(c) Facilitate unloading of limestone by increasing number of railroad siding storage bins.

These results may be accomplished by the following methods, properly co-ordinated by the sales manager:

(1) Use available means of advertising and selling ground limestone by personal solicitation, form letters, booklets, bulletins, etc.

(2) Give agricultural limestone publicity. Co-operate with local and state newspapers and farm journals by offering to maintain a question and answer department regarding limestone. Write articles.

(3) Secure data on good results of limestone. Send data to neighborhood prospects.

(4) Encourage farmers to write their own gratifying results to local newspapers and farm journals.

(5) Co-operate with railroad agricultural agents, local chambers of commerce, Rotary clubs, business men's associations, etc., in securing railroad siding bins for storage.

(6) Co-operate with bankers in securing ready credit for farmers who wish to secure limestone. Give local publicity.

(7) Co-operate with county agricultural agents. Give personal assistance in their clover and limestone campaigns.

(8) Send form letters to selected lists of prospects secured from county agricultural agents, farmers' organization officials, etc.

(9) Send weekly bulletins to county agricultural agents and manufacturers telling about work of other county agents along this line, giving names of new bulletins and other publications regarding use of limestone.

(10) Maintain closest co-operation with state farm bureaus.

(11) Prepare charts and lecture slides for free use of county agricultural agents.

(12) Maintain strongest educational campaign for winter use of limestone and offer special inducements for winter buying.

(13) Maintain fair exhibits if feasible.

(14) Co-operate with state extension departments and experiment stations.

(15) Bulletins to manufacturers regarding sales methods used by other agricultural lime and fertilizer companies.

(16) Copies to manufacturers of other agricultural limestone producers' advertising material and educational publications.

(17) Provide fence signs for satisfied users of agricultural limestone such as "Limestone Pays a Profit."

(18) Publish data secured from satisfied users with photographs of fields.

(19) Make soil map of state or territory of the association showing results of state chemist's soil acidity tests.

(20) Send maps to prospects showing locations and names of satisfied users.

(21) Help organize local buying groups in communities where car lots are not required by individuals.

(22) Keep county agricultural agents supplied with litmus paper pads with advertisements on the back.

(23) Investigate doubtful customers' financial standing and desirability as a credit risk.

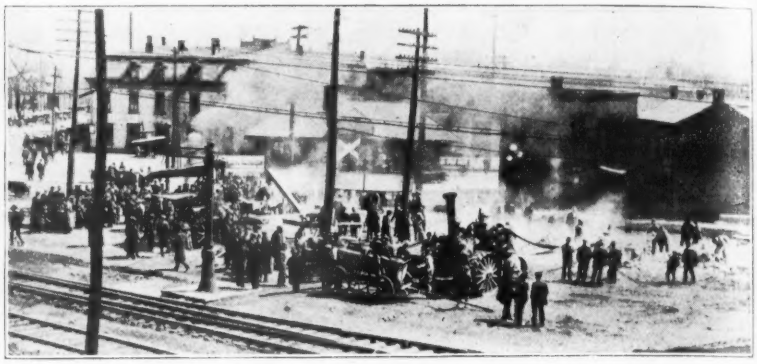
(24) Maintain enthusiastic campaign for use of limestone as filler, or carrier, in the various commercial fertilizers.

Such a manager has a distinct advantage over the field man of a national organization, for he is in position to strike while the iron is hot—to take orders right in the heat of a county agricultural agent's limestone campaign. These orders are subject to confirmation of the manufacturer.

Keeping everlastingly at it will spell success for both the manager and the association. At present the enthusiasm seems to disappear every fall and is revived in the spring.

Every user of limestone must be made a booster. If he is not enthusiastic it is the duty of the manager to co-operate with the county agricultural agent in discovering why the most gratifying of results have not been obtained.

Is it not true that many manufacturers approach the farmer with this attitude: "Here the material is, complying with all specifications of experiment stations; take it or leave it"? The farmers want real service with their orders; those who first give it will profit most.



Some of the methods used to stimulate the demand for agricultural limestone, which the author says must now be supplied by commercial producers.—First and second annual farm pulverizer prize contests at North Vernon, Ind., 1918-1919

Practical Chemistry for Lime and Cement Manufacturers

I—Introduction—Distinction Between Physical and Chemical Changes—Chemical Elements Found in the Rocks and Soil

By Richard K. Meade, M. S.

Consulting Chemical and Industrial Engineer, 11-13 E. Fayette St., Baltimore, Maryland

THE VALUE of the application of science to the solution of everyday problems has been so fully emphasized during the last few years that most practical men now acknowledge that such branches of this as physics, chemistry and geology touch their business very closely. The day when a scientific man was spoken of as being "theoretical" or "impractical" may not have entirely passed, because these objections, when so used, express a state of mind of the individual rather than a fault of science. Most of us know that a theory which will not work out in practice is an unsound theory, and that practice which is not sanctioned by accepted theory is not good practice. After all, sound theories are founded on the observation of actual facts and, as Huxley observed, "Science is nothing but trained and organized common sense."

A knowledge of chemistry would be found indispensable to the lime manufacturer, for many of his problems can be solved, or at least better understood, by applying the principles of this science to their consideration. Few manufacturers, however, would care to devote enough time to the study of chemistry, or have the necessary facilities at hand for carrying out the experimental work, required, for even a good working knowledge of the subject. Nevertheless, there are a *few of the underlying facts of the science* which can be readily imparted within the compass of a series of short technical articles; and, in order to make clearer the subjects of cement manufacture and of lime burning and hydration, the writer is undertaking to explain some of the more elementary laws and facts of chemistry, in this series of short articles.

What Is Chemistry?

Chemistry may be considered as the study of the internal structure of substances and of the changes which can be brought about in this internal structure by various agents such as heat or electricity; or by the action of another substance, such as water. For instance, if we take a piece of limestone and crush it to a fine powder we have produced in the limestone no chemical change. Each tiny particle is still limestone and has all of the properties of this mineral not dependent on quantity. If examined under a microscope it appears to be quite similar to the large piece of limestone. If, on the other hand, we take a piece of limestone and burn it at a high enough temperature, we produce a new substance which has very different properties from the original limestone. For example it falls to a powder when slaked with water, it is found to be caustic, it has a burning taste, etc. In the latter instance, the limestone has undergone a chemical change and an entirely different substance has been produced.

Again, if we boil water, it changes from a liquid to a gas—steam; or if we cool it sufficiently we can produce a solid—ice. In both of these cases, however, no chemical change has been produced. The steam is still water, as we can demonstrate by condensing it; the ice remains water and returns to the liquid state when heated. On the other hand, if an electric current is passed through water, it is decomposed into two gases, oxygen and hydrogen. Neither of these gases has the properties of water and can not be condensed into water. Furthermore, one of them, hydrogen, is highly inflammable, which is not true of steam. Clearly here the water has undergone some important change in its internal structure.

Similarly, if we take some crushed limestone and pour some sulphuric acid upon it, the former dissolves in the acid and bubbles of gas rise out of the liquid. If sufficient limestone is employed the gas will finally cease to rise from it and if we add more limestone no further action takes place. If we now pour the liquid off from the limestone and evaporate this liquid to dryness in a saucer over the radiator or tea kettle, we will obtain a white powder. This powder is quite different from limestone in every way, it will not cause gas to rise when acid is poured upon it and it is also slightly soluble in water. We see, therefore, that when acid acts upon limestone two new substances are formed, a white powder, which is in reality calcium sulphate or gypsum, and a gas, which is carbon dioxide. (A third compound, water, is also formed). This is an example of a chemical change effected by one substance upon another.

From the foregoing it will be surmised that the change which occurs in a boiler is purely physical, while that which occurs in a lime kiln is a chemical change. Similarly, the process which goes on in the quarry and in the raw and clinker mills of the cement plant is a physical change only, but that change which occurs in the kilns is a chemical change. When sand, stone and cement are mixed dry no chemical change occurs and all we have is a mixture of these three substances, but, when water is

Editor's Note

THE MANUFACTURE of lime is a chemical industry. It was one of the first chemical industries. While it is essentially a simple operation, its proper manipulation involves a practical knowledge of some chemistry, whether dignified by that name or not.

The manufacture of cement is an outgrowth of lime burning. Because of the more complicated process it has attracted the attention of engineers and chemists and the portland cement industry is well founded on a scientific basis, while as much can not be said for the much older lime industry.

The average lime and cement manufacturer and plant superintendent is too busy to dig out of technical works on chemistry those parts which he would be most interested in and which he should know something of. Therefore the purpose of this series of articles is to put before the average busy man in simple, non-technical language the essentials of the chemistry underlying his industry.

The author needs no introduction to the lime and cement fraternity. He is one of the foremost authorities on these industries. So while some of the articles may appear very simple and elementary to the trained chemist, it must not be lost sight of that they contain the up-to-the-minute results of scientific study and research.

added, a chemical change does take place and this chemical change causes hardening of the mass.

Instances could be multiplied innumerably, but these are sufficient to illustrate the difference between a chemical change and a change which does not affect the composition of a substance.

The Chemical Elements

Chemists have found by investigation that all matter is composed of certain primary substances which they call elements. So far 83 of these elements have been discovered. These elements are not themselves made up of any other substances and can not be changed into any other substance. No matter how hard they have tried, chemists have been unable to decompose any of the now recognized elements into any other primary bodies. Of course, it is always possible, though not likely, that some substance thought to be an element will turn out to be a compound and new elements are from time to time being found. Sometimes this is by means of a more careful examination of some common thing—for example, since 1892 Lord Ramsey has found several new elements (the gases Argon, Helium, Neon, Krypton and Xenon) in the air, when for many years prior to this the air was supposed to be composed chiefly of oxygen and nitrogen, with a trace of carbon dioxide.

One of the wonders of chemistry is that such a great variety of matter as we know of should result from the various combinations of such a small number of bodies. However, wonders ever multiply in chemistry, not only is all matter composed of some combination of these elements, but 99½ per cent of the entire earth's crust, as far down as it has been explored by man or revealed by volcanic lava, etc., the animal and vegetable organisms on it and the atmosphere surrounding it are composed of but 19 elements. These elements and the relation which they bear to the composition of the earth, according to Prof. F. W. Clarke of the U. S. Geological Survey, are as follows:

AVERAGE COMPOSITION OF KNOWN TERRESTRIAL MATTER

Oxygen	50.02	Carbon	.18
Silicon	25.80	Chlorine	.20
Aluminum	7.30	Phosphorus	.11
Iron	4.18	Sulphur	.11
Calcium	3.22	Barium	.08
Magnesium	2.08	Manganese	.08
Sodium	2.36	Strontium	.02
Potassium	2.28	Nitrogen	.03
Hydrogen	0.95	Fluorine	.10
Titanium	.43	All other elements	.47

Some of the elements do not seem very familiar to us and yet they are present in almost everything about us. Silicon comprises about a quarter of the known matter, and yet of itself it is only found in the chemical museum of schools and colleges. It is present in all rocks and most of these, including soil, clay and sand, are largely composed of silica, a compound of silicon and oxygen. The reader no doubt is surprised to see that aluminum is more plentiful than iron, in view of its much greater cost, and sulphur to be much less common than titanium.

Aluminum is the most widely distributed of the metals. Clay usually contains from 10 to 15% of this element and practically all rocks contain some of this metal. The cost of aluminum is due solely to the difficulty of extracting it. Titanium is nearly always found where aluminum exists, but in much smaller quantity. Of the remaining elements, some like copper, tin and lead, are comparatively rare, although owing to their industrial uses, they are well known; others, like platinum, gold and silver, still more rare, are equally familiar, due to their beauty and intrinsic value; while others, such as radium, rarer yet, are now familiar by reputation to most people because of certain unique properties which they possess. Some few elements have never been isolated and we only know of their presence through certain manifestations which they present.

Most of our common minerals are combinations of two or more of the following elements: Oxygen, silica, aluminum, iron, calcium, magnesium, sodium, potassium, carbon, hydrogen, phosphorus and sulphur. The bodies of plants and animals are chiefly combinations of carbon, hydrogen, oxygen and nitrogen. Smaller percentages of the mineral elements mentioned above are also present. The latter form the ash when the plant is burned.

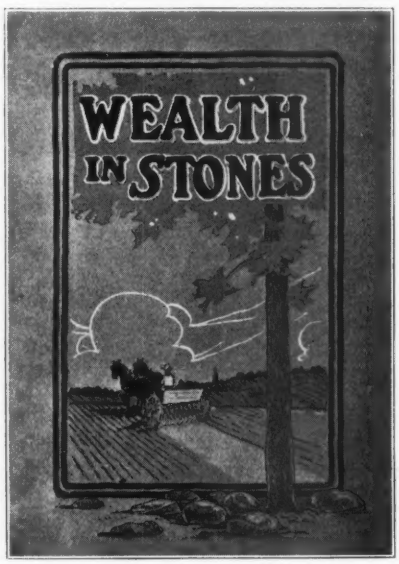
If we analyze any pure chemical compound we will always find it to be composed of the same elements in the same proportions. The latter never vary. So that if we can identify a chemical compound and know that it is pure, we can tell its composition.

We must remember, however, that most substances with which we are familiar are not pure but are mixtures of a number of chemical compounds. Rocks and minerals are rarely ever pure and this applies also to most natural products of the animal and vegetable kingdom.

(To be continued)

"Wealth in Stones"

UNDER THE ABOVE TITLE W. M. Goodman, editor of the "Business Magazine," Knoxville, Tenn., has prepared an exceedingly interesting and instructive booklet on the use of agricultural limestone. The thirty-two pages of illustrated matter are evidently designed to "cash in" on some of the scientific



Cover of new agricultural limestone booklet

facts in regard to southern agriculture, which have been established by experimental station work and by actual field experience, but which needed just such a vehicle as this booklet to reach home to the farmer.

The subject matter has all the local color necessary to make it read by the southern farmers. The crops particularly referred to are clover and peanuts and preservation of pasture lands by liberal use of ground limestone.

The last few pages of the booklet contain arguments to drive home the "Build Limestone Bins at Every Railway Station" policy, which has done so much to increase the use of limestone and phosphate in Illinois. Various methods by which this can be accomplished are described, and these should prove one of the most valuable features of the publication, because the consumption of agricultural limestone can never reach its maximum until this problem of distribution is successfully solved.

Statistical Report of the Lime Industry in Ontario

THE 1918 report of the Ontario Bureau of Mines has just been issued and shows a general depression of the entire rock products industry as compared with previous years. The following is a short summary of the lime industry.

The number of lime producers is steadily decreasing without, however, a decrease in the annual amount of lime produced. This indicates that the smaller lime plants are failing or are absorbed by the bigger companies and that the bigger companies are expanding. Besides building, lime is being used in the manufacture of cyanamid and for the refining of sugar. In 1918, 2,650,285 bu. of lime was produced; the total value of which was $872,177 or the average value was 32.9 cents per bu.

Random Comments on the Issues of the Day

Government Competition

Southern limestone quarrymen are somewhat worried over the outcome of the present proposal to have the Federal Government operate the Muscles Shoals air nitrate plant in northern Alabama. The farmer element of the country as a whole is quite strongly in favor of the bill, now before Congress, which would authorize a government-owned corporation to manufacture ammonium nitrate for sale to the farmers at cost of production.

This product would not come into competition, to any great extent, with anything except the natural nitrates now imported from Chili, and there is apparently not much opposition to the bill on that score. Quarrymen and producers of agricultural lime throughout a wide territory, however, are naturally opposed to the plan of selling the limestone quarry screenings and lime plant waste in competition with their products.

The Muscles Shoals lime plant, if operated to capacity, would produce 500 tons of burnt lime per day. This lime is used in the process, but becomes ultimately a waste product, which can to a considerable extent serve the purposes of agricultural lime. Also, to produce daily 1,000 tons of crushed limestone suitable for the rotary kilns would involve the quarrying of 1,500 tons per day, of which about 500 tons would be fines suitable for agricultural purposes.

This is a much larger production of agricultural limestone than any single quarryman in the South is able to dispose of at the present time. Ultimately it will probably be a very insignificant item in the total consumption of the agricultural South, which has yet hardly awakened to the possibilities of the material as a soil regenerator.

Honest Government competition is not more feared by keen business men than the competition of any other producer; in fact, it would be less feared because every one knows the Government has always failed to run any business efficiently, and very likely will continue to fail. The fear comes from knowing that it is easy for the operators of such an enterprise to hide real costs in order to make a political showing, and consequently to undersell the legitimate producer.

It is, of course, a matter for the quarrymen affected to decide whether the operation of a Government agricultural lime plant in Alabama is a good or a bad thing for the industry. If the Government could be prevented from dumping the stuff on the market at a less-than-cost price, it might prove an ultimate benefit to the agricultural lime industry of the South, because legitimate producers would have the whole-hearted co-operation of a powerful Government agency to increase the consumption and use of the material.

Whether these possible ultimate benefits outweigh the present objections to overproducing the market and the prospect of unfair methods of competition is a matter which ought to be decided by a conference of Southern lime and limestone producers. The point is, however, that the bill is now before Congress, actively supported by Secretary of War Baker, and if any concerted action is to be taken by Southern quarrymen, now is the time to take it.

Association Activities

The decision of the United States Court at Memphis, Tenn., in the case of the American Hardwood Manufacturers Association came somewhat as a surprise to many members of similar trade associations. It would seem, however, from a study of all the facts that the "open price" policy of exchanging quotations is placed in no more danger of being declared illegal than it has always been.

The full details of the charges made against this association, printed on another page of this issue, show that its management was very indiscreet, to say the least.

In itself the exchange of prices and production data is no more contrary to the Sherman law than the price-tagging of commodities offered for sale in a merchant's window. If, however, such a policy results in unjustified profits and such extreme rises in price as can only result from illegal collusion between sellers, then, and only then, is it unlawful.

It is hardly likely that any association of rock products producers is guilty of having obtained excessive profits, not probably because they are more virtuous than other business men, but because crushed stone, sand, gravel and even lime, cement and gypsum are much more difficult to monopolize. They are commodities too easily obtained to ever be in the trust class very long.

The chief result of the Memphis decision should be to give renewed impetus to the movement already on foot to repeal or revise the Sherman anti-trust law. The Government already recognizes that it is poor policy to apply it to the railroads; they are no longer even subject to it, under the new railroad law. Of course we need some restraint on all sellers, because we are all buyers and consumers and want protection from the other fellow as well as freedom for ourselves. But every business man realizes that the Sherman law is out of date and that they can not cope with present problems without their trade associations. Therefore, the sooner we have some definite legislation on the limitations of trade association activities the better it will be for business and the better it will be for the public.

More About the Hardwood Association Decision

Organization Outreached Itself to Prove Efficacy of the "Open-Price" Policy to Raise Prices

OFFICERS AND MEMBERS of trade associations in the rock products industries are taking considerable interest in the decision of the U. S. Circuit Court at Memphis compelling the American Hardwood Manufacturers' Association to desist from the practice of exchanging "Market Information," reported in ROCK PRODUCTS, March 27, page 38.

At that time it was not possible to print the specific charges against the Association. Since then these have been made public, and a perusal of them will set at rest the minds of any members of trade associations in the rock products industries, for it is evident that the fault was chiefly in an over-zealous and indiscreet activity. The charges read as follows:

By joining together as members of a so-called "Open Competition Plan" under the slogan "Co-operation, not competition, is the life of trade"; and by providing and financially supporting at Memphis, Tenn., a suite of offices, clerical force, and the defendant, F. R. Gadd, as manager of statistics, for the successful operation of said plan; by dividing the members of the plan into four geographical groups and holding meetings of each group each month; by printing and causing to be distributed among the defendants recommendations to make oral agreements at such meetings to eliminate competition among these defendants who had been competing, and by this means to suppress "evil practices," meaning thereby the practice of competing in prices so as to secure business by requiring each member of the plan to make monthly "stock reports" to the manager of statistics, showing the normal stock, the entire actual stock, the unsold stock, of each defendant company; and also to make to said manager "production reports" showing the normal monthly production, the actual monthly production, and the estimated future production of each defendant company; and also "sales reports," showing separately each actual sale of hardwood lumber made by each defendant company, giving the name of the buyer, the kind of lumber sold, the destination, and the selling price; by having these reports tabulated by the manager of statistics and distributed among the members of the plan; by distributing among the defendants printed recommendations to discuss prices at their monthly meetings and orally discussing at such monthly meetings said stock reports, production reports and sales reports, so as to produce at each of such meetings a mutual exchange of oral statements of approval of high prices reported in the sales reports as assurances that the defendants would further sustain such prices by maintaining prices as high as or higher than such prices; by mutually exchanging each month through the manager of statistics in connection with the production reports, written predictions by the several defendants that high prices reported in the sales reports would continue to be maintained and enhanced, so as to thus furnish further assurance that the action of each defendant in maintaining and enhancing such price would be supported by like action on the part of other members of the plan; by having distributed by the manager of statistics among the defendants printed expositions of the theory of each defendant, to be observed as a guide to prices reported as received by other defendants, to the effect that knowledge regarding prices actually received is all that is necessary to keep prices at reasonably stable and normal levels, there being no agreement to follow the practices of others, although members do naturally follow their most intelligent competitors if they know what their competitors have been actually doing, this being the theoretical proposition at the basis of the open competition plan; by having questionnaires sent out by the manager of statistics to each member of the plan asking for information showing how the theory of the open competition plan worked in practice, and that the manager of statistics edited these answers and caused to be distributed among the members such parts of them as tended to show that it was successful in producing a steady advance in the prices of their products by printing and causing to be distributed among the defendants arguments against low prices, on the ground of shortage of lumber disclosed by the stock reports and explaining how the disclosure of such shortage in the stock reports prevented prices from being lowered, followed by arguments for still higher prices on the ground of the shortage disclosed, for continued co-operation to secure higher prices on the ground of shortage in stocks, and the elimination of competition; by causing to be reprinted with approval and distributed among themselves, statements emphasizing the advance of prices following the shortage of lumber and urging the defendants against increasing production by night work, which would in effect kill the goose that laid the golden eggs and would be criminal folly coupled with the suggestion made in the sales report that their combination or association, called the open competition plan, to maintain and enhance prices would not be prosecuted; that prices would continue to advance so long as the shortage of lumber was maintained, and that the Sherman law, designed to prevent the restraint of trade, should be repealed.

Mineral Aggregate Association Proves Worth

Further Demonstration of How Wisconsin Organization Helps Its Members as Only a United Industry Can

IF ANY FURTHER PROOF is necessary that a mineral aggregate association is advantageous to all concerned—producer, contractor and public—the activities of the Wisconsin association under its live-wire secretary furnish that proof.

Having the good fortune to do business in a state which has a progressive and aggressive state highway engineer (A. R. Hirst), the Wisconsin Mineral Aggregate Association has been able to be an active force in solving some of the problems of road building under the present difficult circumstances.

At a meeting of the association on March 23 President A. J. Blair pointed out that the next few weeks were likely to be trying ones for a number of the members through their desiring to start activities at their maximum capacity on the opening of the season and the likelihood of insufficient business for maximum capacity operation for the next thirty days.

Anticipating this condition, Secretary O. C. Hubbard phoned the State Highway Department on March 22, advising them that a large number of producers were now operating, with all of them preparing to start up within the next two weeks, and that for the next sixty days would be in a position to ship on state and county road work all the material that the highway authorities could handle. He asked them to write as to the prospects for early business, in line with their promise of assistance in giving wider range of distribution. The following is a copy of a letter from the State Highway Department to county highway commissioners and highway contractors, as well as a letter to Mr. Hubbard in reference to the matter:

COUNTY HIGHWAY COMMISSIONERS AND HIGHWAY CONTRACTORS.

Gentlemen:—We are advised by the commercial producers of mineral aggregates that they are now prepared to start shipments of their materials on a large

scale. Cars will probably be more plentiful during the next two months than later in the season and the pits and quarries can take care of your requirements much better duing these months than at any time during the year.

We suggest therefore the advisability of starting your material shipments as soon as possible. In the case of contract work the Commission will pay the contractor to the extent of 85 per cent of the materials delivered on the road. In the case of day labor work to be done by the Commission on Federal Aid projects, we intend to start shipment in the very near future and arrange for stock piling wherever necessary. We would like also to have the county highway commissioners consider their requirements from commercial plants and to start movement at early date of as much material as they can economically handle.

WISCONSIN HIGHWAY COMMISSION.

The above letter was signed by J. E. Gillespie, who wrote to Mr. Hubbard as follows:

I am enclosing a copy of a letter which I am sending today to all of the county highway commissioners and to the highway contractors who have already secured jobs for this year or who have work left over from last season. I had a talk yesterday with Mr. Hirst about the matter of moving materials and he says that we will do everything possible to co-operate in this. We are going to give the matter some additional thought and if we can see any other way that we can help the situation we will most assuredly take steps to do so.

In the case of our own day labor construction, we will write special letters to the county highway commissioners advising them to get their unloading machinery ready and to start shipments almost immediately.

Obviously the same kind of co-operation between the producers and the public authorities would not be possible if two rival associations were fighting for favor, nor could the same kind of assistance be given producers at the season of the year they need a helping hand.

Eastern Building Material Still Unsettled in Prices

Building Material Dealers Wait for Further Market Developments Before Making Big Contract Prices

BUILDING CONSTRUCTION as a local industry seems to have taken its strongest forward stride so far this year, says the Dow Service Daily Building Reports. The expectation of big things to develop in the construction market seems to be centered upon the intimation that the Albany Legislature will promptly enact laws to keep the prospective builder in the market in order to quickly relieve the housing and commercial space shortage.

Another definite effort seems to be under way to stabilize the building material prices at least until the demand again exceeds the supply. At the present time most of the basic building material plants supplying this market have fairly good supplies on hand. The production of portland cement for the first and second months of the year showed an increase of 70 per cent over the production of 1919, with shipments hardly more than 60 per cent.

This problem of car shortage is piling up reserves at the mills, and is further encouraging the building material distributors of New York to take a stand for stabilization of prices.

Possible Labor Trouble

Chauffeurs of sand trucks threatened to go out on strike, demanding $42 a week, with 5½ days to the week, and 8 hours per day. These men have been working on an old schedule of $30 a week, 6 days to the week and 10 hours per day. There does not seem to be any general objection to granting these men an increase on the new arrangements, but vigorous protest is being made to the threat that unless they are accorded what they demand they will declare an embargo against the delivery of all kinds of building materials upon any job in New York. The building material dealers do not hesitate to say that they are prepared to fight this issue to a complete standstill rather than to submit to dictation of this sort.

The attitude of the distributors is in exact conformity with the attitude of most of the building trades and financial institutions to the effect that this is not the right time to force recognition of organized power on either side. The public demands relief from space shortage at the earliest possible moment, and the building season is now fairly under way with little or no progress being made to relieve the famine.

Producers "Watchfully Waiting"

Building construction, material and equipment companies who were very positive they were going to have all the business they could take care of this year, are not now quite so sure about it. Producers of basic commodities are following the policy of "waiting for markets to develop." They are not willing to quote far enough into the future to cover even moderate sized projects.

White plaster is already out of the market, and will be in this condition for the next six or eight weeks, the mills say. Manufacturers declare they have no white plaster to offer. Incidentally there is likely to be a change upward in rebate value of sacks from 15 to 25c. This ten cent advance represents a difference of $2 a ton to the consumer until he returns his sacks. There is no relief in the gypsum market from the railroad car shortage, which has forced shutdowns in the Buffalo district.

Cement Prices Up

The Alpha and Vulcanite Portland Cement companies advanced their wholesale price 10 cents a barrel. This change is not expected to be followed by other companies as the mark-up was made to offset the shipping costs favoring the Hudson River branches of these mills over the Lehigh district plants. There is plenty of cement at the mills, but there are very few cars in which to ship it. In consequence the market is running low on this commodity.

There seems to be plenty of stone and marble which can be delivered promptly. There is some delay now and then on account of cars and transportation, but outside of the delay caused by strikes, etc., the stone business is in a flourishing condition. Since the capacity of the plants is large there is hardly a limit to the amount of work that can be done by them.

The outstanding characteristics of the belated formal opening of the building season for 1920 is first, demand; second, the general disposition to keep building material prices under control; third, to avoid any attempt at artificial restriction of production; fourth, the general expectation that the Legislature at Albany will promptly offset any possible disquietude on the part of prospective mortgage investors and finally the crystallization of public sentiment against further sacrifice of its health and comfort while various factors wrestle for power.

Kentucky Sandstone Quarry Operator Strikes Oil

LUCK OCCASIONALLY comes to a crushed-stone quarryman. The lucky operator this time is F. M. Hansbarger of Seebree, Ky., who writes to ROCK PRODUCTS that oil is oozing out around the first level of his quarry floor. This is the Green River quarry, referred to in ROCK PRODUCTS, February 28, p. 27, which has been furnishing crushed stone for the construction of Ohio River dam and lock No. 48. Oil men are already exploring the property.

Commercial Explosives—III

(By the Engineering Department of the National Safety Council)

THAW HOUSES are usually located so as to be convenient to the quarry, mine opening or placed where the explosives are to be used. For this reason and others practically the same precautions should be observed in construction that have been mentioned in connection with magazine construction. Many different types of thaw houses have been constructed and various methods of introducing heat have been employed, but the Bureau of Mines, after some years of investigation and experimentation, has designed and constructed a most satisfactory thaw house, entrance into which is difficult and is, in fact, unnecessary, for all of the trays can be removed from the outside. Other advantages are: All parts of the thaw house are accessible for cleaning; the explosives can be distributed in thin layers in the trays, the thermometers are easily read from the outside; the source of heat is not in the thaw house proper, but in a separate compartment at its side, and hence explosives cannot come in contact with the heating element; the explosives are not subjected to the evil effects of free steam or water; the temperature is surely and easily controlled from the outside; the stack makes possible the positive circulation of heated air.

Source of Heat

As a source of heat, low pressure steam is probably one of the safest and most effective means of thawing explosives. Low pressure steam is usually available and should not be used at a pressure in excess of three pounds. It is advisable to use both a pressure-reducing valve and a weighted relief valve in the steam line. The temperature of the air entering the thaw house should never exceed 130 degrees F. and it is desirable, if possible, to maintain the temperature at a uniform mark of 90 degrees F.

In some thaw houses it may be more convenient to use hot water as a means of heating, in which case a greater radiating surface is required than for steam heating. If no other means for heating can be provided a special small hot water heater may be installed, but this must be in a separate compartment, placed at least four yards from the thaw house.

Electric heaters are known to be less efficient and less safe than low pressure steam or hot water for thawing explosives; nevertheless, in certain work electricity is the only source of heat available. If heated electrically, the Bureau of Mines thaw house requires about seven kilowatts of energy to maintain an average temperature of 90 degrees F. within the house when the outside temperature is 55 degrees F. Heaters, therefore, should be provided that have a maximum capacity of 7 kilowatts, a minimum capacity of 2 kilowatts, and several steps between these limits to take care of intermediate temperatures. All switches and fuses should be carefully installed and placed on the outside of the heating compartment. Only flame-proof insulated wire should be used and the voltage, preferably not higher than 110 volts, should never be higher than 250 volts. The Bureau of Mines gives a list of specifications for the use of electric heaters, and unless these specifications are carefully followed it is advised that low pressure steam or hot water heat be used.

Tamping, Charging and Firing

Wood pulp or sand may make a fine stemming or tamping material, but moist clay when made into dummy cartridges with thin paper covers which can easily be broken probably gives best results. Drilling, bug dust or coal shack should not be used as stemming.

Metal tamping bars are dangerous and their use in some states is prohibited by law. Tamping bars should be made of hard wood of a diameter slightly less than that of the hole.

Black powder should not be charged in the loose form. It should be packed just before use in paper cases or cartridges provided for the purpose. If the hole is dry these cartridges may be broken so that the powder will pack more closely. Care should be exercised, however, not to break the cartridge before it reaches the bottom of the hole.

High explosives are usually purchased in cartridge form and the operators, knowing what size of cartridges are available, drill their holes enough larger so cartridges will fit in snugly. Drills should not be used when the points have been worn below gauge size, for when this happens the loading of the explosive becomes difficult and dangerous. If it becomes necessary to take explosives from their wrappers in order to fit them into a hole, they should not be charged loose, but first made into new cartridges. In coal mines and in similarly dangerous places a limited charge of 1½ pounds has been established for permissible explosives.

(To be continued.)

General News from Rock Products Markets

U. S. Government as Competitor in the Quarry Game?

THE ACCOMPANYING views show the beginning of operation of what may eventually be the largest limestone quarry of the South. This quarry is being opened by the Ordnance Department of the United States Army at Waco, Ala., for the ultimate purpose of supplying high calcium limestone to the Muscles Shoals air nitrate plant.

The requirements are for 1,000 tons of high calcium carbonate limestone of from 1½ to ⅜-in. size. This will require the quarrying of 1,500 tons of stone per day, for it is the experience of quarrymen in the neighborhood that about one-third of the stone reduces to screenings during crushing.

The quarry is located at the foot of a rather high mountain in a flat field and is being opened so as to develop a straight face some 1,000 ft. in length. The fact that some difficulty will be encountered with drainage is evident by the use of two small gasoline pumps on the small openings already made when the quarry was visited.

In order to open the quarry, a small portable plant has been put up and the stone is being used on nearby roads, etc. The face as opened exposes a high-grade oolithic limestone, but it is predicted by quarrymen who are familiar with the neighborhood that the stone is of a boulder formation and that fissures and mud seams will decrease the desirability of the deposit as a quarry proposition.

Quarry being opened and operated by the Ordnance Department of the U. S. Army at Waco, Ala.

Crushing plant of the U. S. Government quarry at Waco, Ala., as it is today

Southern States Road-Building Prospects Bright

ATLANTA, Ga.—More than $25,000,000 will be expended in the construction and improvement of roads in the sixteen southern states this year, according to definite projects of this nature either already in progress or ready for the work to begin, it has been announced by the Bureau of Roads of the United States Department of Agriculture. Estimates of these projects show that 2,671 miles of roads will be constructed or improved, the cost, according to the estimates of the department, will be $23,393,827. However, this is by no means the total amount that will be expended this year in such work, as many other road construction projects have been agreed upon between the Federal Government and the governments of the various states affected. These have not been definitely announced and are therefore not included in this estimate.

The cost of the above is divided on the basis of 40 per cent paid by the Federal Government and 60 per cent by the states concerned.

In most cases the road improvement projects have been made possible by bond issues, and in communities where these issues were voted on they have almost invariably been carried by big majorities.

Georgia ranks second in total mileage among all the southern states, and first among the states of the southeastern area, while Texas, because of its immense size, holds first place in total mileage for the entire South.

Southern Contractor and Quarryman Builds Auxiliary Plant

THE FOSTER AND CREIGHTON CO., whose main offices are at Nashville, Tenn., is a large contracting company as well as one of the largest crushed-stone and dimension-stone operators of the South. The company's main quarries are at Rockwood, Ala., but it has recently opened a small fluxing stone and agricultural limestone plant at Carters Creek, Ga. This plant has a daily capacity of 200 tons.

This quarry is a hand-loading operation and the material is drawn to the crushing plant by mules. The crushing plant consists of a No. 5 McCully crusher, a No. 3 Austin crusher and a Gardner pulverizer. The limestone runs 95 per cent calcium carbonate and for this reason the plant is used entirely for fluxing stone and agricultural limestone.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.			From stock, 1.50 per net ton, all sizes			
Burlington, Vt.	1.00	.....	2.50	2.00	2.00	.....
Chaumont, N. Y.	.....	1.75	1.65	1.35	1.25	1.25
Coldwater, N. Y.			Flux, 1.50@2.10			
Limekiln, Md.	1.25	2.10	2.00	1.75	1.40	1.25
North Leroy and Akron, N. Y.	1.00	1.00	1.00	1.00	1.00	1.00‖
Utica, N. Y.	1.00		All other sizes 1.50			
CENTRAL:						
Alden, Ia.	.70	.70	1.35	1.35	1.35	1.35
Alton, Ill.	2.00	2.50	1.50	1.50	1.50	.....
Bettendorf, Ia.			1.50 per cu. yd., all sizes			
Buffalo, Ia.	.....	.....	1.60	1.50	1.50	.....
Chicago, Ill.	1.25	2.00	1.65	1.50	1.50	1.50
Cincinnati, Ohio	.....	2.00	2.00	2.00	.....	.....
Cleveland, Ohio	.....	2.40	2.20	2.20	.....	.....
Davenport, Ia.	1.50*	1.50*	1.50*	1.50*	.....	.....
Detroit, Mich.	.....	2.40	1.70	1.60	.....	.....
Dundas, Ont.	.75	1.35	1.35	1.35	1.25	1.10
Eden and Knowles, Wis.	1.00@1.10	1.10@1.20	1.10@1.20	1.10@1.20	1.10@1.20	.....
Elmhurst, Ill.	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25	1.00@1.25
Ft. Wayne, Ind.	1.60	1.90	1.90	1.80	1.60	1.60
Greencastle, Ind.	1.50	1.25	1.10	1.00	1.00	1.00
Hull, Canada	2.50	2.30	2.50	2.10	2.00	1.75
Illinois, Southern	2.00	1.50	1.50	1.50	1.50	.....
Krause, or Columbia, Ill.	1.80	1.30	1.50	1.40	1.30	1.30
Laumon, Wis.	1.25	1.25	1.25	1.25	1.25	1.25
Lima, Ohio	1.40	1.40	1.40	1.40	1.40	1.40
Mansfield, Ohio	1.70	2.20	2.00	1.90	1.70	1.70
Oshkosh, Wis.			1.40 per ton, all sizes			
River Rouge, Mich.	.....	1.50	1.50	1.50	1.50	1.50
St. Louis, Mo.	.60	1.60	.....	.....	.....	.....
Silica, Ohio	1.00	1.50	1.30	1.20	1.00	1.00
Stone City, Ia.	.80	.....	1.60	1.50	1.40	.....
Toledo, Ohio, f. o. b. cars	1.60	2.10	1.90	1.80	1.60	1.60
Toronto, Canada	1.55	2.25	2.25	2.25	2.05	2.00
SOUTHERN:			These prices include 90c freight			
Brooksville, Fla.	1.00	.....	.....	2.25	2.25	.....
Cartersville, Ga.	.....	2.25	2.10	2.00	.....	1.90
Chickamauga, Tenn.	1.50	1.75	1.75	1.75	1.75	1.75
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	1.00
Mascot, Tenn.	.....	1.50	1.50@1.75	1.50@1.75	1.50@1.75	.....
Memphis Jct., Ky.			1.10@1.35, all sizes			
New Braunfels, Tex.	.60	1.75	1.65	1.50	1.50	1.50
Winnfield, La.	.80	2.50	.....	2.00	2.00	.....
WESTERN:						
Atchison, Kans.	.50	2.00	2.00	2.00	1.90	1.90
Blue Springs and Wymore, Neb.	.20	1.75	1.75	1.65	1.55	1.50
Kansas City, Mo.	.60	2.00	.....	.....	.....	.....
Mankato, Minn.	.....	.....	.....	1.75	1.50	.....

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Baltimore, Md.	.....	.90	2.75	2.50	2.00	1.75
Bernardsville, N. J.	.....	2.80	2.60	2.20	.....	.....
Branford, Conn.	.80	1.50	1.50	1.20	1.10	.....
Birdsboro, Pa.	1.40	1.90	1.80	1.60	1.40	1.40
Castro Pt., Richmond, Cal.	.50*	.....	1.50*	1 50*	1.40*	.....
Dresser Jct., Wis.	.75	2.25	2.25	2.00	1.70	.....
Duluth, Minn.	.75	1.75	1.50	1.25	1.25	.....
E. Summit, N. J.			(2.75@2.85, all sizes)			
Glen Mills, Pa.	1.00	1.35	1.70	1.55	1.35	1.35‖
Meriden, Conn.	.80	1.75	1.75	1.50	1.40	.....
Millington, N. J.	1.80	1.80	1.80	1.60	1.00	.....
New Britain, Conn.	.80	1.30	1.25	1.20	1.00	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Dundas, Ont.—Flint	1.10	1.10	1.10	1.10	1.10	1.10
Little Falls, N. Y.—Syenite	.80	1.20	1.40	1.20	1.20	1.20‖
Mayville, Wis.	.90@1.00	1.10@1.25	1.10@1.25	1.10@1.25	1.10@1.25	1.10@1.25
Middlebrook, Mo.—Granite	3.50	.....	1.75	1.75	.....	1.00‡
Portland, Maine—Granite	1.50	.....	.....	1.35	1.25	.....
Roseburg, Ore.	.....	1.50	1.25	1.05	1.00	1.00
Stockbridge, Ga.—Granite	.50	2.00	1.90	1.75	1.75	.....
White Haven, Pa.—Sandstone	.85	1.20	1.40	1.20	1.20	1.20‖
Granite	1.25	.....	1.50	1.50	1.50	.....

*Cubic yard. †Agrl. lime. ‖R. R. ballast. §Flux. ‡Rip-rap. a 3-inch and less.

Agricultural Limestone

EASTERN:

Coldwater, N. Y.—Analysis, 56.77% $CaCo_3$, 41.74% $MgCo_3$—80% thru 100 mesh; bags, 4.50; bulk 3.00

Chaumont, N. Y.—Analysis: $CaCo_3$, 92 to 98%; $MgCo_3$, 1.51%—(Thru 100 mesh); sacks, 4.00; bulk 2.50

Grove City, Pa.—Analysis: $CaCo_3$, 94.75%; $MgCo_3$, 1.20%—(70% thru 100 mesh); 80 lb. ppr., 4.60; bulk 3.25

Grove, Md.—90% thru 4 mesh; bulk 3.00

Hillsville, Pa.—Analysis, $CaCo_3$, 96% (90% thru 100 mesh); sacks, 4.50; bulk 2.75

Jamesville, N. Y.—68% thru 100 mesh; 95% thru 50; 100% thru 20. Sacks, 3.75; bulk 2.25

Syracuse, N. Y.—Analysis, 90% carbonates (50% thru 100 mesh, 90% thru 50 mesh); sacks, 3.50; bulk 1.75

Walford, Pa.—(70% thru 100 mesh; 85% thru 50; 50% thru 50; 100% thru 4); sacked, 4.25; bulk 2.75

West Stockbridge, Mass.—Analysis: Combined carbonate, 95%—33% thru 200 mesh; 66% thru 100; 100% thru 40. Bulk 2.85

Williamsport, Pa.—Analysis, $CaCo_3$, 88-90%; $MgCo_3$, 3-4%—(50% thru 50 mesh); sacks, 4.50; bulk 3.00

CENTRAL:

Alden, Iowa—Analysis, CO_3, 99.16%; bulk ..... .80

Alton, Ill.—Analysis: $CaCo_3$, 96%; $MgCo_3$, 0.75%—50% thru 4 mesh 2.50

Bedford, Ind.—(90% thru 10 mesh) Analysis, $CaCo_3$, 98.5%; $MgCo_3$, 0.5% 1.75

Belleville, Ont.—Analysis, $CaCo_3$, 90.9%; $MgCo_3$, 1.15% (45 to 50% thru 100 mesh; 61 to 70% thru 50 mesh); bulk 2.50

Chicago, Ill.—Analysis, $CaCo_3$, 53.63%; $MgCo_3$, 37.51%—90% thru 50 mesh 1.00

Columbia, Ill., near East St. Louis (½" down) ..... 1.25@1.80

Ellettsville, Ind.—Analysis, Carbonate, 98% 2.00

Elmhurst, Ill.—(Analysis, $CaCo_3$, 35.73%; $MgCo_3$, 20.69%) 50% thru 50 mesh 1.25

Greencastle, Ind.—(Analysis, $CaCo_3$, 98%) 50% thru 50 mesh 1.75

Howenstein, O.—100% thru 10 mesh; 59% thru 50; 39% thru 100 ..... 2.75@3.00

Kansas City—(50% thru 50 mesh) 2.00

Lannon, Wis.—(90% thru 50 mesh) Analysis, 54%, $CaCo_3$; 44%, $MgCo_3$ 2.00

Marblehead, O.—(Analysis: $CaCo_3$, 95.33%) 100% thru 100 mesh, sacks, 4.75; bulk 2.75

McCook, Ill.—Analysis, $CaCo_3$, 54.10%; $MgCo_3$, 45.04%—100% thru ¼" sieve; 78.12% thru No. 10; 53.29% thru No. 20; 38.14% thru No. 30; 26.04% thru No. 50; 16.27% thru 100 ..... .90@1.00

Milltown, Ind.—Analysis, $CaCo_3$, 94%; $MgCo_3$, 3%—(100% thru 4 mesh) 1.50

Montrose, Ia.—(90% thru 100 mesh) 1.25

Muskegon, Mich.—(90% thru 50 mesh) Analysis, $CaCo_3$, 53.35%; $MgCo_3$, 43.27% 2.50

Piqua, O.—Analysis: $CaCo_3$, 82.8%; $MgCo_3$, 8.2%; neutralizing power in terms of calcium carbonate, 95.3%—70% thru 100 mesh; bulk ..... 2.75@4.50

Stolle, Ill. (near East St. Louis on I. C. R. R.)—(Thru ½" mesh) Analysis, $CaCo_3$, 89.61 to 89.91%; $MgCo_3$, 3.82% 2.00

St. Paul, Ind.—Analysis, $CaCo_3$, 85%; $MgCo_3$, 12% 1.50

Stone City, Ia.—Analysis, $CaCo_3$, 98% (50% thru 100 mesh) ..... .80

Toledo, O.—Analysis, $CaCo_3$, 52.72%; $MgCo_3$, 43%—(20% thru 100 mesh); 30% thru 50; 80% thru 100; 100% thru 5/32 screen) 1.80

Whitehill, Ill.—Analysis, $CaCo_3$, 96.12%; $MgCo_3$, 2.50%—
90% thru 50 mesh, bulk 2.00
90% thru 100 mesh 5.00

(Continued on next page.)

Agricultural Limestone

(Continued from preceding page.)

SOUTHERN:

Cartersville, Ga.—Analysis: 96 to 98% combined carbonates—All thru 10 mesh with all dust in 2.50

Claremont, Va. (Marlime)—Analysis, 90.94% $CaCo_3$, 0.31% P., 1.36% Mg., 0.37% K.; bulk 4.50
100 lb. ppr. bags 6.00
100 lb. cloth bags 6.50

Dittlinger, Tex.—Analysis, $CaCo_3$, 99.09%; $MgCo_3$, .04%.
90% thru 100 mesh 2.00
90% thru 4 mesh 1.00

Grovania, Ga.—Analysis, $CaCo_3$, 95%; $MgCo_3$, none—50% thru 100 mesh 2.50

Hopkinsville, Ky.—Analysis, 94.6 to 98.1% $CaCo_3$—Bulk 2.00

Linnville Falls, N. C.—Analysis, $CaCo_3$, 54%; $MgCo_3$, 42%—50% thru 100 mesh; sacks, 4.00; bulk 2.50

Marion, Ga.—Analysis, 90% $CaCo_3$—(50% thru 100 mesh) 2.00

Memphis Jct., Ky.—(Analysis, $CaCo_3$, 95.31%; $MgCo_3$, 1.12%); average price, ½ in. down 2.00

Mascot, Tenn.—Analysis, $CaCo_3$, 52%; $MgCo_3$, 38%.
(80% thru 100 mesh) 2.75
(All thru 10 mesh) 2.25
(80% thru 200 mesh) 4.00
Paper bags, $1.50 extra per ton; burlap, 2.00 extra per ton.

Maxwell, Va. 2.50

Mountville, Va.—Analysis, $CaCo_3$, 76.6%; $MgCo_3$, 22.8%—100% thru 20 mesh; sacks, 5.50; bulk 4.50

Ocala, Fla.—Analysis, $CaCo_3$, 98%—(75% thru 200 mesh) 4.50

Tyrone, Ky.—Analysis, $CaCo_3$, 93%; $MgCo_3$, 6%—90% thru 4 mesh 2.25

Winnfield, La.—(50% thru 50 mesh) 3.00

WESTERN:

Cement, Calif.—50% thru 50 mesh 4.00

Colton, Calif.—Analysis: $CaCo_3$, 95%; $MgCo_3$, 1½%; bulk, 2.50; bags 2.50
Sacks, 15c extra, returnable.

Kansas City, Mo., Corrigan Sid'g—50% thru 50 mesh; bulk 1.35

Terminous, Calif.—Analysis, 94% $CaCo_3$, 1.4% $MgCo_3$—(60% thru 200 mesh; 90% thru 100 mesh; 100% thru 40 mesh); sacks, 4.50; bulk 4.00

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:

Berkeley Springs, W. Va. ..... 2.25@2.75
Special hand selected rock 2.50
Bridgeton, N. J. 2.00
Cedarville and South Vineland, N. J.—
Glass, damp 2.00
Glass, dry 2.50
Gray Summit, Mo. ..... 2.00@2.50
Guion, Ark.—Carlots 2.00
Hancock, Md.—Damp 2.00
Klondike and Pacific, Mo.:
Contracts 2.00
Carlots 3.00
Mapleton, Pa. 2.50
Glass, damp 2.00
Massillon, Ohio 3.00
Michigan City, Ind. ..... .50
Millington, Ill.—Contracts 2.00
Mineral Ridge, O. 3.00
Montoursville, Pa.—Green, washed 1.50
Oregon, Ill.—Large contracts 1.75
Open market 2.50
Ottawa, Ill. ..... 1.75@2.50
Robinson, Md., washed, screened, not dried 2.00
St. Marys, Pa.—Green 2.50
Sands, Elk Co., Pa.—Selected, green 2.75
Thayers, W. Va.—Washed 2.75
Unwashed 2.50
Utica, Ill. ..... 1.75@2.50

FOUNDRY SAND:

Albany, N. Y.—Core 1.50
Furnace lining ..... 2.25@2.50
Molding coarse, fine 2.50
Brass molding 2.50
Sand blast ..... 2.50@3.75
Allentown, Pa.—Core ..... 1.50@1.75
Molding coarse 1.50
Arenzville, Ill.—Molding fine ..... 1.50@1.75
Beach City, Ohio—Core 2.50
Green silica sand (not dried) 2.25
Washed silica sand (not dried) 2.50
Sand blast ..... 2.75@3.50
Bowmantown, Pa.—Core 1.25
Plastering sand 1.30
Molding, fine and coarse 1.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Ambridge, South Heights, Pa.		1.30		1.30	1.00	1.00
Attica, N. Y.	.65	.65	.65	.75	.75	.75
Concord Jct., Mass.	1.25	1.00	1.50	1.50	1.50	1.50
Farmingdale, N. J.	.68	.48	1.50	1.35	1.35	1.30
Hartford, Conn.	.90		1.25	1.15	1.15	1.15
Ludlow, Mass.		.75			1.10	1.00
Morristown, N. J.	.60	.60	1.75		1.40	1.35
Portland, Me.	1.00	.50@ .60		1.35	1.25	
Washington, D. C. (F. O. B. wharves on cars)	.75	.75	2.00	1.40	1.20	1.20
Yardsville, N. J.			.50@ .75, all sizes			
CENTRAL:						
Alton, Ill.	.60@ .75	.60@ .75	1.50@4.50	1.30	1.20	1.20
Anson, Wis.		.60@ .75		1.25@1.50		.90@1.25
Attica, Covington, Silverwood, Ind.	.85	.85	.85	.85	.85	.85
Barton, Wis.	.85	.70	1.00	.80	.80	.80
Beloit, Wis.			.60 sand, 1.00 gravel			
Chicago, Ill.		1.30@1.40	1.30@1.50			
Columbus, Ohio		.70@1.00	.70@1.00	1.00	.70@1.00	.70@1.00
Covington, Ind.	.75	.75	.85	.75	.75	.75
Des Moines, Ia.	.75@1.00	.75	1.65	1.65	1.50	1.50
Earlestead (near Flint), Mich.	.60	.60				.70
Eau Claire, Wis.	.70	.70	2.25		1.35	
Elgin, Ill.		.80	1.00	.80	.80	.80
Ft. Dodge, Ia.	1.35	1.25	2.15			2.05
Ft. Jefferson, Mechanicsb'g, O.	.50@ .60	.50@ .60	.50@ .60	.60@ .70	.60@ .70	.60@ .70
Grand Rapids, Mich.	.50	.60	1.00	.90	.80	.80
Grass, Mich.		1.00	1.60	1.20	1.20	1.20
Greenbush, Mich.	.50	.80	1.00	1.25	1.25	
Indianapolis, Ind.	.60	.60		1.50	.75	.75
Mason City, Ia.	.85	.75	1.65	1.60	1.50	1.40
Milwaukee, Wis.	1.25	1.25	1.35	1.35	1.35	1.35
Minneapolis, Minn.	.50	.50	1.75	1.75	1.50	1.50
Oxford, Mich.			(60-40 mix, .85 per ton)			
Pittsburgh, Pa.			(Sand, 1.30; gravel, 1.00)			
St. Louis, Mo., F. O. B. cars.	2.20@2.25		2.50	2.30	2.30	2.25
Summit Grove, Ind.	.85	.85	.85	.85	.85	.85
Terre Haute, Ind.	.75	.75		.85	.75	.75
Toledo, Ohio	.75	.75				
Yorkville, Moronts, Oregon and Ottawa, Ill.	.70	.70	.80	.80	.80	.80
SOUTHERN:						
Alexandria, La.		.80				1.35@1.75
Flomation, Ala.		.85			1.80	
Knoxville, Tenn.	1.15	1.15	1.50	1.50	1.50	1.40
Lake Weir, Fla.		.60				
Lincoln, Neb.	.90	.90	2.20	2.20		
Macon, Ga.		.75				
Memphis, Tenn.		(Sand, 1.25 per cu. yd.; gravel, 1.50 per cu. yd.)				
N. Martinsville, W. Va.		1.10@1.20				.90@1.00
Pelzer, S. C.	.80	.80				
Pine Bluff, Ark.	1.20	1.20		1.30 all other sizes		
Roseland, La.		.35			1.25	
Thomas, La.	.60					1.75
Tulsa, Okla.		.70				
Valde Rouge, La.		.80				1.25@1.50
Waco, Texas	.70@ .80	.70@ .80				1.10
WESTERN:						
Essex, Humboldt Co., Calif.		1.35	1.35	1.35	1.35	1.35
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.		(Kaw River sand, car lots, .75 per ton, Missouri River, 1.50)				
Niles, Calif.	.80@1.00	.70@ .85	.75@1.00	.70@1.00	.70@1.00	.70@1.00
Saratoga, San Jose, Calif.		.60@ .75	.60@ .70	.60@ .70	.60@ .70	.60@ .70
Seattle, Wash.	1.25	1.25	2.00	1.25	1.25	1.25
Vancouver, B. C.		1.30*		1.30*		1.10*
Yorkville, Ore.	.60	.60@ .75	.70	.60@ .75	.60	.50@ .60

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Boonville, N. Y.	.60@ .85	.60@ .75				.85
Burnside, Conn.	.80*					
Fishers, N. Y.	.70@ .80	.75@ .90				.85@ .90
Yardville, N. J.		.50@ .75				
York, Pa.		1.10@1.30	(crushed rock sand)			
CENTRAL:						
Earlestead, (near Flint, Mich.)			.60 per yd.			
Grand Rapids, Mich.	.40			.75		.60
Grass, Mich.		.60	1.00	1.00	1.00	1.00
Greenbush, Mich.	.65					
Illinois, Northern						.50@ .60
Janesville, Wis.		.65			.75	
Lincoln, Neb.			Sand gravel mix, 1.30			
Oxford, Mich.			Including cobbles, $1.00 per yd.			
Summit Grove, Ind.	.65	.65	.65	.65	.65	.65
SOUTHERN:						
Albany, Ga.	.70@1.00					
Dudley, Ky. (Crushed Sand)		.95		1.00		
Lindsay, Tex.	1.00					.50@ .75
Thomas, La.						.40@ .70
Valde Rouge, La.						.60@ .75
Waco, Texas						.95
WESTERN:						
Niles, Calif.	.25@ .40					
Pueblo, Col.		River Run, .75* unscreened				
Saratoga, San Jose, Calif.		.60@ .75	.60@ .70	.60@ .70	.60@ .70	.60@ .70
Yorkville, Ore.		.40			.40	

* Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Bethlehem and Emaus, Pa.	2.50	.90	1.50	1.00	1.00	1.00	1.00
Buffalo, N. Y.	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Cleveland, Ohio.		.85		1.05	1.05	.95	.95
E. Canaan, Conn.	3.50	1.10	3.00	1.35	1.25	1.25	1.25
Erie, Pa.		1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.		1.25	1.25	1.25	1.25	1.25	1.25
Ensley, Ala.	2.05	1.00	1.25	1.25	1.25	1.00	.95
Hokendaugua and Donaghmore, Pa.	2.50	.90	1.50	1.00	1.00	1.00	1.00
Lebanon, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Philadelphia Dist.	2.50	1.00	1.50	1.00	1.00	1.00	1.00
Pittsburgh, Pa., Dist.	2.05	1.15	1.50	1.15	1.15	1.15	1.15
Sharpsville, Pa.	2.00	1.20	1.60	1.20	1.20	1.20	1.20
CENTRAL:							
Chicago, Ill.	All sizes, $1.50, F. O. B. Chicago						
Detroit, Mich.	All sizes, 1.65, F. O. B. Detroit						
Ensley, Ala.	2.05	1.00	1.10	1.25	1.25	1.00	.95
Ironton and Jackson, O.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
Toledo, O.	All sizes, 2.00, F. O. B. Toledo						
Youngstown, Dover, Hubbard and Leetonia, O.	2.00	1.20	1.60	1.20	1.20	1.20	1.20

Agricultural Lime and Hydrate

	Agricultural Lime—Bulk	Agricultural Lime—Bags	Per Cent CaO	Per Cent MgO	Agricultural Hydrate Bags
EASTERN:					
Adams, Mass.			98	38	8.00
Apollo, Pa.	3.25		95.14	1.44	
Bellefonte, Pa.	8.00		98.5	.72	11.50
Berkeley, R. I.		14.00	45	15	
Bridgeport, Pa.	7.50@9.00		55	44	9.00@11.00
Cavendish, Vt.	2.50 bbl. in car lots				
Cavetown, Md.	8.50				
Cedar Hollow, Devault, Rambo and Swedeland, Pa.	8.00	10.75 grd.	58	38	10.75
Chippewa, Pa.	6.00		78.67	1.33	
Farnams, Mass.	6.00	7.50	60	2	
Frederick, Md.	7.75		88	5 to 8	10.50
Grove City, Pa.	3.25	4.50	94.75	1.20	10.25
Grove, Md.	8.00				10.75
Highgate Springs, Vt.		8.00	85	2	
Hollidaysburg, Pa.	5.50@7.50		94.68		
Hyndman, Pa.	5.00	8.50	80.23	2.87	
Lime Bluff, Pa.	5.00@6.25		78.67	1.33	
Lime Kiln, Md.	8.00	10.75			10.75
Lime Ridge, Pa.	5.25		80.56-62.56	3.87-1.75	
Newburgh, N. Y.			57	38	8.00
New Castle, Pa.	3.50	4.50	47.6 to 50.4	0.62 to 1.12	
Paxtang, Pa.	5.50@7.00		60	12	
Rosendale, N. Y.	8.00	9.00	92	5	
Sandyville, O.					9.00
Steuben, Pa., Dover Plains, N. Y., York, Pa.		7.00@9.50	70		10.75 to 12.00
Union Bridge, Md.	8.50		73	1	10.75
Williamsport, Pa.	5.50	10.00	65 to 80	2 to 4	10.00
Williams Station, Pa.	7.50		60.6	39.1	9.75@10.50
York, Pa.	8.00		90 to 95	2 to 7	10.75
CENTRAL:					
Alton, Ill.	10.50		94.0		
Delaware, O.			50.0	5-12	10.50
Forest, O.	7.50				
Knowles, Wis.		9.00	55	45	11.50
Manistique, Mich.	11.00		95	2	11.00
Marblehead, Ohio			54	16.0	9.75
Mitchell, Ind.	9.00				12.50
Sheboygan, Wis.	5.50	8.50	58	40.5	
Springfield, Ohio			33.62	17.73	10.50
Woodville, Ohio		9.25	47-48	31-32	10.50
SOUTHERN:					
Blowers, Fla.	5.00	7.25	98.0		
Burns, Tenn.	9.50		96	0.54	13.00
Chippewa, Fla.	5.00		80.0	15.0	
Dittlinger, Texas		9.00@11.00	98.62	0.29	12.50@15.00
Erin, Tenn.	9.50		97.82	0.12	
Karo, Va.	8.00		97.0	1.26	
Lineton, Va.	8.50		97	1.74	
Lushing, Va.	9.00	11.25	60	15	12.75
Maxwell, Va.	6.00	9.00	88	1.75	
Newala, Ala.	8.50@9.00		99.33		
Ocala, Fla.	4.00	6.00 pulv.	98½ (dry basis)		
Staunton, Va.	7.50		96.48		
WESTERN:					
Bellins, Wash.					12.00
Colton, Calif.	4.50		97	2	15.00
Kirkland, N. Mex.	12.00				
Lime, Ore.	15.00		91.48	0.58	
Oscas Island, Wash.		5.50			16.50
San Francisco, Calif.					15.00
Tehachapi, Cal.	6.00	8.00	96	2	

Miscellaneous Sands

(Continued from preceding page)

Bridgeton, N. J.—Core	2.00
Cleveland, O.—Molding coarse	2.50
Brass molding	2.50
Molding fine	2.75
Columbus, O.—Core	2.00
Brass molding	2.50
Molding fine, steel molding	2.50
Conneaut, O.—	
Molding fine	2.75@3.00
Molding coarse	2.50@2.75
Eau Claire, Wis.—Core	2.25
Brass molding and sand blast	2.25
Fleetwood, Pa.—Furnace lining	2.25
Franklin, Pa.—Traction	2.50
Brass molding	2.75
Molding fine, steel molding	3.00
Molding, coarse	3.00
Sand blast	5.00
Core	2.50
Greenville, Ill.—Molding coarse red	1.60@1.80
Guion, Ark.—Molding fine	2.00@2.25
Roofing	3.00
Stone sawing	2.50
Hancock, Md.—Core and brass mldg.	1.65
Hellam, Pa.—Core	2.00@2.50
Joplin, Mo.—Stone sawing, flint	1.25
Kansas City, Mo.—Missouri River core	.85
Klondike and Gray Summit, Mo.—Molding fine	2.00@2.50
Lake Weir, Fla.—Sand blast	.60
Mapleton, Pa.—Molding, fine and core, damp	2.00@2.50
Molding, fine, dry	3.00
Massillon, O.—Molding fine	3.00
Molding coarse	3.00
Traction	2.75
Furnace lining	3.00
Core	3.00
Michigan City, Ind.—Core, bank	.50@.60
Traction	.50
Millington, Ill.—Roofing, stone sawing	2.00
Core and furnace lining	1.75
Core	1.50
Mineral Ridge, O.—Core, molding, sand blast, roofing, brass molding, etc., washed, screened (damp)	2.75
Montoursville, Pa.—Core	1.25@1.50
Traction	1.15@1.35
Brass molding	1.25
Ohio—Various points:	
Iron molding, fine	1.50@2.25
Iron molding, coarse	1.75
Brass molding, minimum	2.00
Oregon, Ill.—Core	1.75@3.00
Furnace lining	1.75@3.00
Sand blast	3.00@3.50
Molding fine	1.75@3.00
Ottawa, Ill.—Core, furnace lining, molding fine and coarse (washed and dried)	1.75@2.50
Core, furnace lining, molding fine (crude)	.75@1.00
Molding coarse (crude)	.75
Roofing line	1.75@3.00
Sand blast	3.00@5.00
Stone sawing	2.50
Traction	1.75@2.50
Brass molding	2.00@2.50
Providence, R. I.—Molding fine	2.00
Molding coarse	1.90
Brass molding	2.25
Sand blast	3.00@4.00
Sugar Grove, Ohio—Core (dried and screened)	2.00
Traction	2.00
Thayers, Pa.—Core and traction	2.00
Furnace lining, molding	1.25
Utica, Pa.—Core	2.00
Molding coarse, traction	2.50
Brass molding	2.75
Sand blast	3.50
Warwick, Ohio—Core, furnace lining, molding fine and coarse (dry and screened)	2.50@2.75
Core, furnace lining, molding fine and coarse (green)	2.25
Wedron, Ill.—Core, (crude silica)	.75@1.00
Molding fine, coarse	.75@1.00
West Albany, N. Y.—Molding fine	1.75@2.25
Molding coarse	1.50
Brass molding	1.75
Zanesville, Ohio—Molding fine and brass	2.50@2.75
Molding coarse	2.25@2.50

Gypsum, per Ton

Castalia, O.—Crushed, to cement mills	3.50
Ground, to cement mills	3.50
Land plaster	6.00
Bags extra—Jute, 3.00; ppr., 1.00 per ton.	
Fort Dodge, Ia., bulk	3.50
Garhutt, N. Y.—Land plaster, bags	7.50
Grand Rapids, Mich.—Crushed gypsum	4.50
Ground gypsum rock	9.00
Gypsumville, Man., Can. (crushed)	3.50
Oakfield, N. Y.	7.50
Sandusky, O.	6.00

Jute sacks, $3.00 extra; paper, $1.00 extra.

Ground Rock Phosphate

Centerville, Tenn.—B. P. L., 70%; ton, 2000 lbs. (90% thru 100 mesh)	9.00@10.00
Lump rock, 72% to 75%, B. P. L.	6.00@8.50
Centreville, Tenn.—B. P. L., 60%	7.00
B. P. L., 70%	9.00@10.00
Gordonsburg, Tenn.—2000 lbs. (90% thru 100 mesh)—B. P. L., 60%	6.00
B. P. L., 65%	7.00
B. P. L., 70%	8.00@10.00
B. P. L., 75%	12.00
Mt. Pleasant, Tenn.—(B. P. L. 68%) 13%	7.00
14%	8.00
Mt. Pleasant, Tenn.—B. P. L., 70%	10.00
Nichols, Fla.—Pebble, B. P. L., 68%	10.00
Wales, Tenn. (95% thru 100 mesh) (guaranteed 14% phosphorus equivalent)	7.00@8.25
Walls, Tenn.—B. P. L., 70.2%—	
To County Agri. Assns.	7.50
To others	7.75

Florida Soft Phosphate

Croon, Fla.—Ground pebble, 30%	16.00
Pulverized soft, 26%	17.50
Jacksonville (Fla.) District	10.00@12.00
(Add 2.50 for sacks)	
Phoslime, Fla. (in burlap bags, 100-200 lbs.)	15.00

Passed By The Screens

Incorporations

Homer **Barksdale** has recently acquired and is now operating a rock crushing plant at Ranger, Texas.

Thos. H. **Holman**, of Farmington, Mo., is forming a company to build a crusher plant two miles south of Bismark, Mo. The capital stock will be $10,000.

Walter **L. Morgan**, Shreveport, La., has recently leased 2,000 acres of property and will install a gravel plant at a cost of from $50,000 to $100,000.

The **American Humus and Phosphate Co.**, Richmond, Va., has been incorporated with $300,000 capital stock to build a large fertilizer plant at Lakeland, Fla.

Dolomite Products Co., Inc., Rochester, N. Y., has been incorporated to do quarrying, metallurgical and minerallogical operations. The capital is $165,000.

The **Delta Construction and Sand Co.**, Clarksdale, Miss., has been incorporated with $200,000 capital. The incorporators are S. L. Dodds, Jake Fink and M. Halpin.

The **W. H. Cloud Moulding Sand Co.**, Louisville, Ky., has been incorporated with a capital of $5,000. The incorporators are W. H. Cloud, L. M. Cloud and W. R. Neill.

The **Clifton Forge Marble and Granite Works, Inc.**, Clifton, Va., has been organized with a capital of $50,000. The incorporators are: H. F. Brat, president, and Stuart Wansley, secretary.

The **C. E. Willmering Sand and Gravel Co.**, Amarillo, Texas, has been incorporated with a capital stock of $30,000. The incorporators are C. E. Willmering, G. T. Grove and E. T. Miller.

The **Pure Talc Mining Co.**, Philadelphia, Pa., has been incorporated with a capital of $500,000 to manufacture talc products. The incorporators are M. L. Horty, M. C. Kely and S. L. Mackey.

The **Young Sand and Gravel Corporation**, New York City, N. Y., has been incorporated to produce and deal in sand and gravel. The capital is $1,000,000 and the company was incorporated by A. R. Oakley, Pearl River, N. Y.

The **Vermont Milling Products Corporation**, Boston and Fairhaven, Vt., has been incorporated to mine and quarry slate. The capital stock is $2,000,000 and the directors are H. W. Lakin, president; G. F. Reif, treasurer, and F. E. Nye.

The **Boyer Valley Sand and Gravel Co.**, Woodbine, Iowa, has been incorporated to produce sand and gravel. The capital stock is $150,000 and the incorporators are: F. W. Barrett, president; F. W. Elston, vice-president, and T. L. Hupp, secretary and treasurer.

The **Utica Sand and Gravel Co., Inc.**, Utica, N. Y., has been incorporated with the following officers: H. H. Buchanan, president; E. E. Sweet, vice-president and general manager; Howard Smith, treasurer; H. S. Greene, secretary. The directors include all of the officers and Clifton Cruickshank.

The **General Granite Co.**, St. Cloud, Minn., has been incorporated for the purpose of quarrying and manufacturing granite, marble, etc., into building material. The capital is $50,000 and the company officers are W. F. Donohue, president; Florentine Zins, vice-president; J. J. Quigley, secretary and treasurer.

The **Ontario Cement Co.**, Brantford, Ont., has recently been formed. It has purchased the plant of the Ontario Portland Cement Co., Blue Lake, near St. George, Ont., and will remove the plant to Blackville, where the new company has purchased 170 acres of property. Kenneth W. Harvey is the managing director of the company.

The **Loncala Phosphate Co.**, Ocala, Fla., has been incorporated with a capital of $1,000,000. The incorporators are: William Jennings, president; Thomas Sexton, general superintendent; T. F. Fay of New York, W. J. Farmer of Savannah and E. H. Martin of Ocala, directors. President Jennings represents English capitalists and purchased the Dutton Phosphate Co. of Gainesville. The new company owns 40,000 acres in phosphate belt, and drying-storing-shipping terminal at Jacksonville. It will build four plants, and within three months will have a monthly output of 6,000 to 7,000 tons phosphate rock. Future plans propose two additional plants, which will increase the output to 9,000 or 10,000 tons.

Manufacturers

The Roessler and Hasslacher Chemical Co. announces that after April 1 its main offices will be changed to 709-717 Sixth Avenue, corner Forty-First Street, New York City, N. Y. The postoffice box number will be 119, Times Square Station.

The Tarvin Pulverizer Co., Maryville, Tenn., has been incorporated for the purpose of manufacturing limestone pulverizers and limestone products. The capital stock is $100,000. Incorporators: J. C. Tarvin, H. G. Tarvin, E. F. Ames and others.

Sauerman Brothers, Chicago, Ill., have just issued a very complete catalog of dragline cableway excavators, which will prove of great value to all owners and prospective owners of sand and gravel plants. The book contains 128 pages and every type of dragline installation is illustrated, together with much general information on the design and operation of dragline plants.

The Weller Mfg. Co., Chicago, Ill., is now represented in the southeastern states by H. Deverell, 1401 Lexington Building, Baltimore, Md. Mr. Deverell was formerly head of Deverell, Spencer & Co. He is a competent engineer and is well equipped to take care of any elevating, conveying or power-transmitting problem submitted to him.

The Goodyear Tire & Rubber Co., Akron, O., has issued an "Encyclopedia of Goodyear Mechanical Rubber Goods," which should be in the hands of every rock products producer using conveyor belts. All necessary information is given for estimating the conveyor-belt requirements of a plant, with much general information on design. Also, bucket elevators are similarly treated.

The Barber-Greene Co., Aurora, Ill., manufacturers of standardized belt conveyors and self-feeding bucket loaders, announces that owing to the great increase of business it has had to make several additions and changes in its selling forces. The company is now represented in the different sections of the country as follows: St. Louis, by R. E. Foulke, 404 Third National Bank Building; Pittsburgh, by J. A. Gurney, 605-606 Arrott Building; Philadelphia, by F. S. Sawyer, 1010 Penn Square Building; Indianapolis, by W. T. MacDonald, 305 Merchants Bank Building.

Personals

G. E. Warren has resigned his position as assistant manager of the service bureau of the Universal Portland Cement Co., Chicago, taking effect April 1, 1920, to continue his duties as manager of the American Concrete Pipe Association. Mr. Warren has been with the service bureau of the Universal company for five years, during the last year of which he has also acted as secretary-treasurer of the American Concrete Pipe Association. This association has recently been reorganized and will open an office in Chicago with sufficient help to carry on its broadened activities. J. W. Lowell, eastern manager of the service bureau of the Universal Portland Cement Co., beginning April 1, will assume the duties of assistant manager of the same department at its headquarters in Chicago.

H. B. Herrick has been appointed general manager of the Eldred Stone Co., Carlinville, Ill. The Eldred Stone Co. operates a quarry at Eldred which manufactures agricultural limestone and crushed rock. The need for limestone for fertilizing is becoming more and more apparent, and the growing demands have increased the business of the company to large proportions. Under the management of Mr. Herrick it is believed that this industry will prosper extensively. He comes to Carlinville from Litchfield well recommended as a business man of ability and experience. He has been the faithful and efficient cashier of the Litchfield National Bank for the past twelve years, and by his efforts has contributed largely to the success and prosperity of that institution of which he remains a director.

Cement

The Kosmos Portland Cement Co., Kosmosdale, Ky., in spite of adverse conditions which existed early in the spring, is planning for a big season. For a period of over two weeks the company was forced to reduce to one-half capacity because of fuel shortage. At the same time the influenza epidemic reduced its labor forces to about two-thirds normal. Orders have been booked for the output of the next several months and so all possible speed is being made to better conditions. In order to be able to ship more material into Louisville the company keeps one large steel-tired, six-ton truck busy hauling cement to the interurban line two miles distant from the plant. The company is also hoping to be able to develop river traffic to such points as are available. Some little business has been done on the river where contractors or purchasers came after material with their own barges. As yet no dock equipment has been installed and so the loading of cement is slow and expensive. In view of the considerable business on hand, the company is enlarging its power plant by adding another turbine unit so that the plant may be driven either as a whole or at half capacity with better efficiency. The old engines now being used to drive the small Fuller mills on the raw side will be removed and individual motor drive will replace them. A new 100,000-barrel cement storage has just been completed and packing machinery is being installed. The new packing house is across the railroad from the rest of the plant and cement is delivered to it by a long conveyor belt.

Lime

The York Valley Lime and Stone Co., York, Pa., is now being operated, with Robert H. Lafean as manager. It is expected to open the lime plant in the fall with a capacity of from 780 to 1,200 bbls. daily, running 12 kilns. The new crushing plant is in course of erection and after May 20 will have a daily output of 800 tons of crushed stone. The company will also manufacture hydrated lime and pulverized limestone.

The Wheeler Lime Manufacturing Co., Willock, Tenn., of which F. H. Wheeler is owner and president, is planning on considerable expansion this year and the next few to come. At present the plant has two 11x35 steel lined kilns and a hand-loading operated quarry. It is planned to add a third kiln this year and a fourth next year. When the plant is completed as is intended it will also have a hydrator and will be quite modern. The limestone from which the lime is burned is very pure and suitable for chemical works. Mr. Wheeler is also considering putting in a crushing plant to turn out ballast. This is the second year of operation of the plant and the quarry is just beginning to get well opened, the face is now 35 ft. high.

Talc and Soapstone

The Talc Products Co., Inc., Washington Building, Los Angeles, Calif., has recently been organized to develop a large body of talc one mile north of Riggs, San Bernardino County, California. This deposit contains a compact, white talc which can be sawed into crayons. The company's mill at Los Angeles is equipped with a unit of the Raymond system of grinding and air separation and pencil sawing machines. It is reported that the pencils are being successfully used in Pacific Coast ship yards.

The sale of the Balmat mine of the International Pulp Co., near Gouverneur, N. Y., to J. H. McLear, Gouverneur, and H. G. McLear, New York, has been reported. It is stated that a large part of the property has been already leased to the Sylvia Lake Co., which will operate it. The first mining done on this property was for silver and lead, but it developed into a good zinc-producing property and later it was worked for its talc deposits. It has passed through several hands, the American Pulp Co., the Union Talc Co., and the International Pulp Co., all having had it in successive periods since 1891.

Passed By The Screens

Sand and Gravel

The Northern Granite Co., Neshkoro, Wis., has given notice of dissolution.

The Western Indiana Gravel Co., Terre Haute, Ind., increased its capital stock from $200,000 to $400,000.

The Glacial Sand and Gravel Co., Zanesville, Ohio, has increased its capital stock from $10,000 to $25,000.

The Daigler Sand and Gravel Co., Williamsville, N. Y., has increased its capital stock from $50,000 to $100,000.

The Detroit-Greenville Gravel Co., plant at Detroit and home office at Greenville, Ohio, has increased its capital from $200,000 to $400,000.

The Dolese and Shepard Co. has surrendered its charter for quarrying and has sold its sand and gravel lands in the state of Wisconsin. The home office is Chicago, Ill. This does not, of course, affect their interests in the state of Illinois.

The E. T. Slider Co., Ohio River sand and gravel operators, which operates two yards, one in New Albany, Ind. and one in Louisville, Ky., is just getting its big digger ready for operation. The entire boat is being overhauled and put into running order after the winter lay up. Cold weather has somewhat delayed the work, but the big demand for material will necessitate operation as soon as possible. A No. 36 Symon disc crusher is being installed. This will be the company's first experience with a crusher mounted on the digger.

The Ohio River Sand and Gravel Co., Louisville, Ky., started its diggers up the river the last week in February. This is at least a month earlier than operation was ever started before, but owing to the unusual amount of construction work going on in Louisville the supply yards were empty and so the company started operation as soon as the river would permit. Material is being delivered as fast as it can be brought up from the river, and judging from the early start and the volume of business on the company books there is to be a great demand for material this year. Last fall the season was ended with 25,000 cu. yds. in storage, but all of this is gone and all that has since been produced is sold. Early high water and intermittent freezing weather somewhat hampered the operation. The company is anticipating some changes to increase the capacity. The two 10-in. pumps are to be replaced with 15-in. pumps. Some time ago the company tried a crusher on one of its diggers, but without a great deal of success. It is now considering catching all of the oversize stone in a barge and building a shore-crushing plant. The trouble now with discarding them back into the river is that they are often pumped over again. Since the boulders are granite the product could be sold as crushed granite.

Personals

C. M. Wood, formerly sales engineer for the H. W. Johns-Manville Co. and a man of wide experience in road engineering and highway construction, has assumed charge of the recently established Good Roads Bureau of the Goodyear Tire & Rubber Co., Akron, Ohio, and will devote his entire time to the furtherance of good roads agitation throughout the United States. Mr. Wood is a native of Texas. After graduating from Cornell as a mechanical engineer, he followed engineering work in Mexico and the South and Southwest for eight years. The next two and a half years were spend in sales engineering work for a Chicago cement company. Prior to his affiliation with the Johns-Manville Co., Mr. Wood acted as department manager for the Portland Cement Association. Briefly, the functions of the bureau as outlined by Mr. Wood are: To distribute reliable data on good roads and highways; to take an active part in good roads movements wherever possible by means of lectures, personal calls and advertising; to collect and investigate state and national highway legislation; to support financially and otherwise local good roads organizations as may be deemed expedient; and to prepare and issue pertinent literature for public distribution, covering good roads, their advantages, and the details of financing road improvement and highway construction.

David J. Kelly, assistant superintendent of the sand rock plant of the Pittsburgh Plate Glass Co., Ford City, Pa., has resigned and entered the employment of the General Rock Products Co., Pittsburgh, Pa., as general manager of quarry operations.

Charles C. Phelps recently has become associated with the Uehling Instrument Co., 71 Broadway, New York. This company has capacity as combustion engineers, as well as manufacturers of CO_2 recording equipment and other fuel economy apparatus. Mr. Phelps is devoting most of his attention to research work in connection with the efficient combustion of fuel oil in boiler furnaces. It is estimated that nearly $100,000,000 is wasted unnecessarily every year, due to improper methods of burning fuel oil, which fact shows the importance of this field of investigation. Mr. Phelps graduated from Stevens Institute of Technology, Hoboken, N. J., with the degree of Mechanical Engineer and has since spent several years studying power plant problems. For five years of this period he was connected with the Ingersoll Rand Co., manufacturers of power plant equipment and pneumatic machinery. Mr. Phelps is an associate member of the American Society of Mechanical Engineers.

OBITUARY

F. C. Gordon, president of the Gordon Sand Co., Conneaut, Ohio, died at his home in Conneaut on March 12. Mr. Gordon's personality and wise power of decision was greatly instrumental in the upbuilding of the company which he brought into existence and which bears his name.

Quarries

The Kentucky Crushed Stone Co., Evansville, Ind., has filed final papers of dissolution.

The Tulsa Stone Co., Tulsa, Okla., has increased its capital stock from $10,000 to $20,000.

The Ohio Bluff Sandstone Co., Cleveland, Ohio, has filled an amendment to the articles of incorporation, increasing the capital stock from $150,000 to $350,000.

The Wagner Quarries Co., Sandusky, Ohio, suffered fire loss of $5,000 when fire of unknown origin damaged the power plant from which it secures the power to operate its No. 4 quarries near Castalia.

The Grove City Limestone Co., Sharpon, Pa., has moved its office headquarters to the corner of Bread and Lincoln streets. This company operates one of the largest quarries in western Pennsylvania. The property is located at Drenchton, Pa. Stone for concrete construction and road building are the two big outlets now.

M. Bennett & Sons, highway contractors of Indiana county, Pennsylvania, recently bought the blue-stone quarry of McSpadden Bros., near Strangford, Pa., on the Bolivar branch of the P. R. R., about two miles east of Blairsville, Pa. A new boiler, engine, crusher and conveyors have been purchased. A railroad siding is laid into the quarry. The Bennetts expect to use most of the stone on their own highway contracts.

The Lusk Quarries Co., Inc., Lusk, Wyo., held its annual meeting at which time A. L. Miller was elected president; Louis Seyboldt, vice-president, and J. F. Mergen, secretary and treasurer. It was decided to increase the capitalization to $50,000, of which $20,000 will be issued now. Those who held stock before the increase will have first chance to purchase new stock. The plant is in charge of J. F. Mergen, who is a civil engineer and has had considerable experience in this line of work. New equipment will be purchased and installed immediately and it is expected that the quarries will be running at full capacity in the near future.

Retail Dealers

The Wilson Sand & Supply Co., Huntington, W. Va., suffered a loss of $10,000 on March 3, when fire damaged its property at the foot of Twelfth street.

The B-J Concrete Products Co., Red Oaks, Iowa, has been incorporated for $50,000. The incorporators are C. H. Barnes, president; C. F. Wilson, vice-president, and R. W. Jackson, secretary and treasurer.

The Larson Brothers Co., Kenosha, Wis., has been incorporated for $75,000, to deal in all kinds of building materials. The incorporators are Albert M. Larson, Lewis E. Larson, Fred B. Larson, all of Kenosha.

The Baumann Coal Co., Racine, Wis., has been incorporated for $25,000, to deal in lime, cement, gravel, stone, sand, brick and all other kinds of building materials. Fred A. Baumann, Anna M. Baumann, Lewis J. Quinn.

The Red Wing Structural Tile Co., Red Wing, Minn., has been organized by W. L. Murtinger, well-known local contractor and builder; Frank Mehrkins and C. W. Fenstermacher. The new company will manufacture cement products, specializing in cement building tile. The factory will be situated in West Red Wing on the site known as the old Brink brick factory. Machinery which has been purchased and which will be operated by electricity, will be installed as quickly as possible, and it is hoped to have the plant in operation by April 30. The cement tile for building construction will be 5x8x12 in. in size. The plant at the start will have a capacity of 6,000 pieces of tile daily.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of Rock Products, published every other week at 542 S. Dearborn St., Chicago, Illinois, for **April 1, 1920.**

State of Illinois, County of Cook.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Geo. P. Miller, who, having been duly sworn according to law, deposes and says that he is the business manager of the Rock Products and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation, etc.), of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Tradepress Publishing Corporation. Editor, Nathan C. Rockwood. Managing editor, Nathan C. Rockwood. Business managers, C. H. Fuller and Geo. P. Miller, all at 542 S. Dearborn St., Chicago, Ill.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.) Tradepress Publishing Corporation, W. D. Callender, Geo. P. Miller, T. J. Sullivan and N. C. Rockwood, all at 542 S. Dearborn St., Chicago, Ill.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) There are none.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest, direct or indirect, in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is .....

(This information is required from daily publications only.)

(Signed) GEO. P. MILLER,
Business Manager.

Sworn to and subscribed before me this 29th day of March, 1920.

MABEL OLSEN, Notary Public.

(My commission expires April 12, 1922.)

Form 3526.—Ed. 1016.

USED EQUIPMENT

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

STONE CRUSHERS

We are headquarters for good, modern "used" machinery of this character, buying and selling

GYRATORY CRUSHERS
JAW CRUSHERS
CRUSHING ROLLS
DISC MACHINES
PULVERIZERS, ETC.

Also Steam Shovels, Cranes, Locomotives, Cars, Rails, Air Compressors, Cableways, Road Building Machinery, etc.

Wm. B. Grimshaw Co., 1048 Drexel Bldg., Phila., Pa.

Dealers in USED but NOT ABUSED Machinery

FOR SALE

1—No. 7½ Austin Crusher, almost new.
1—Class "G" Duplex Air Compressor, capacity 925 F.P.M.
1—Class "H" Duplex Air Compressor, capacity 342 cu. ft. per min.
1—14 x 20 Atlas Plain Side Crank Steam Engine.
1—14 x 20 Russell Side Crank Steam Engine.
1—11 x 16 Side Crank Steam Engine.
1—Model "G" Marion Steam Shovel, good condition, low price.
1—17 x 24—4-4-0 American Passenger Locomotive.
1—10 x 16—36" gauge Vulcan Saddle Tank Locomotive. (Boiler needs overhauling.)
2—13-Ton Standard gauge Whitcomb Gasoline Locomotives.
1—10-Ton Superior Stone Grapple.
1—40" x 13' Revolving Screen.
1—Well Drill.

THE CASPARIS STONE CO.
Clinton Bldg., Columbus, Ohio

Miscellaneous

Your Prospective Customers

are listed in our Catalog of 99% guaranteed Mailing Lists. It also contains vital suggestions how to advertise and sell profitably by mail. Counts and prices given on 9000 different national Lists, covering all classes; for instance, Farmers, Noodle Mfrs., Hardware Dlrs., Zinc Mines, etc. *This valuable reference book free.* Write for it.

Send Them Sales Letters

You can produce sales or inquiries with personal letters. Many concerns all over U. S. are profitably using Sales Letters we write. Send for *free* instructive booklet, *"Value of Sales Letters."*

Ross-Gould Mailing Lists St. Louis

FOR SALE—TRUCKS

2—Knox Tractors, Model No. 35. 40 H. P. 4 cyl. motors—8 cy. end dump.
2—Knox Tractors, No. 35. 40 H. P. 4 cyl. 12 cy. side dump.
2—Knox Tractors, Model No. 36. 40 H. P. 4 cyl. 3 cy. side dump.
4—10 cy. gravity side dump 4-wheel Lee Trailers.

Dunbar & Sullivan Dredging Co.
2212 Dime Bank Bldg. Detroit, Mich.

WANTED

One cross, compound, duplex air compressor, 10½ cylinder, rated 150 cu. ft. per minute. Address

BUFFALO CEMENT CO., Ltd.
110 Franklin St. Buffalo, N. Y.

FOR SALE

One Hammer Mill Pulverizer, rebuilt; absolutely as good as new; will sell at low cash price; can be inspected in Chicago.

Box 1386 Care of Rock Products

FOR SALE

Hydrate Lime Plant Equipment; new; never been used. Raymond Brothers No. 0 Pulverizer, complete with Separator; No. 11 Fan, 7 ft. Cyclone Dust Collector, necessary piping and special 12x24 Hydrated Lime Feeder. For quick sale—bargain price. Delivery at once.

The Cedarville Lime Co., Cedarville, Ohio

Wanted

Steam Driven, Locomotive Type Air Compressor to attach to steam shovel for Rock Work. To deliver 100 cu. ft. A. P. M. against pressure of from 80 to 100 lbs.

Security Cement and Lime Company
Hagerstown, Md.

Immediate Delivery

10K GATES, mang. fitted. Reg. drive, 50 ft. elev. 2 screens. **All $8500.00.** Prac. new.
20—Crushers, Nos. 2 to 10 mostly Gates.
1—327 HP. W. T. Boiler. $8.00 HP.
9—150 HP. 125 lb. H.R.T. boilers, butt strap.
2—48"x12' Taylor Manganese screens.
25—Air compressors, 60 to 4000 cu. ft.
50—Steam engines, 30 to 1500 HP.
1—95 HP. Loco. type boiler. Ill. ship.
75—Steam and Centrifugal Pumps.
1—30-60 HP. Emerson-Brantingham tractor.
Concrete mixers—Contractors Equip.
Send us your inquiries for electrical equip., engines, hoists, etc.

Ross Power Equipment Co.
Indianapolis, Ind.

FOR SALE

1—1½ yd. Negley Slack Line Bucket, Carriage, and 550' 1¼" Yellow Strand Cable. Good condition.

1—10" Manganese Steel Sand Pump, belt driven, with suction pipe and long curved elbow.

THE CARMICHAEL GRAVEL COMPANY
700 Rialto Building, St. Louis, Missouri
(Also—Williamsport, Indiana)

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All sections on hand for quick shipment. Reasonable prices quoted. Our stock is very complete.

M. K. FRANK
Frick Building Pittsburgh, Pa.

CLASSIFIED ADVERTISING

Rates for advertising in the Classified Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion.

Help Wanted

WANTED

Young man for assistant superintendent who has exceptional mechanical ability, familiar with the Raymond pulverizing system, capable of handling men with best results, able to give uniform capacity of plant by eliminating breakdowns to the minimum. Knowledge of operation that is essential for economical production, and upkeep of machinery. Submit references.

Address Box 1397, Care of Rock Products

WANTED
GENERAL SUPERINTENDENT

For large quarry operation. Must be familiar with handling steam shovels, locomotives, large crushers, etc. State past experience, age and salary expected. Give references. Knowledge of heavy blasting and upkeep of all machinery to insure efficient and economical operation necessary. Must have Pep. Address

Box 1400 **Care of Rock Products**

WANTED

Competent man to operate 12" AMSCO sand dredging pump. In reply give age, experience, and salary expected.

ROCKFORD SAND AND GRAVEL CO.
609 Trust Building **Rockford, Ill.**

WANTED

Quarry foreman for cement plant quarry. Must be experienced in blasting, steam shovel work and handling of labor. State age, experience and wages expected.

Address Box 1398, Care of Rock Products

WANTED

Experienced trap rock crushing plant operator. Plant consisting of 60" x 84" jaw crusher, nine gyratory crushers, electrically driven. Must have thorough knowledge of economical production for continuous operation. State age, experience, reference and salary wanted.

Box 1399 **Care of Rock Products**

Plants For Sale

For Sale or Lease

Crushed stone plant, capacity 800 tons per day, fully equipped, 30 ft. ledge, light stone, no stripping, best in Missouri, no competition. Address

Box 1390 **Care of Rock Products**

Situation Wanted

SITUATION WANTED

Superintendent desires engagement where thorough knowledge of operation is essential for economical production; thorough knowledge of heavy blasting and efficient upkeep of machinery. References. Address

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Storage bins that are fire-proof, water-proof, wear and weather proof! Preston Lansing Bins of vitrified tile last indefinitely—repairs and upkeep are nil. Save yard space and handling expense. Cost per year of service is low. Get full particulars. Send for catalog and prices.

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Factories at Uhrichsville, Ohio; Brazil, Indiana; Ft. Dodge, Iowa

Storage Bin of Becker Limestone Company, Lincoln Park, N. Y.

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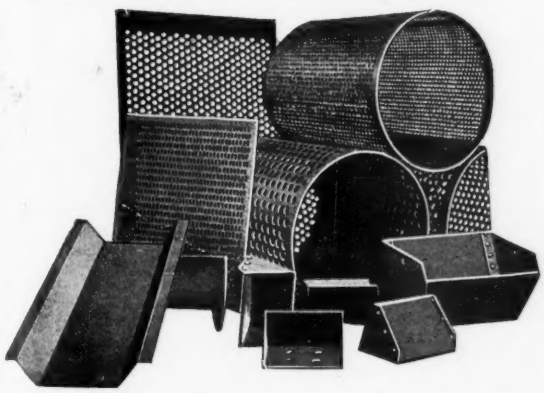

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The biggest value for your money. Universal crushers and pulverizers reduce stone to desired size or fineness in a jiffy!
Fifteen years of designing and building experience have made possible the exceptional ability of Universals.

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225 Third Street
Cedar Rapids, Iowa, U.S.A.

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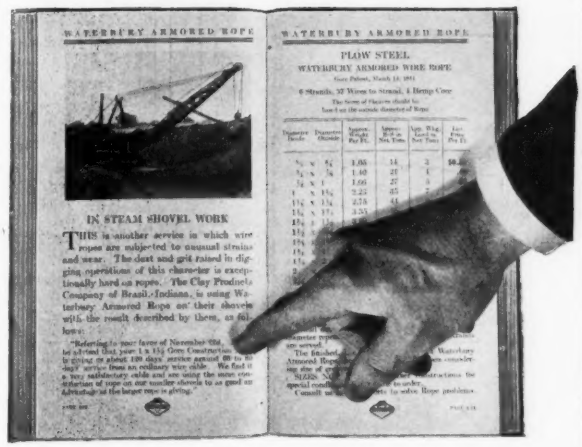

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The flat armor wire takes the wear for the life of one ordinary rope, and as it wears, packs down into the strands, making a smooth surface which gives them more than another rope's life.*

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*The Waterbury Rope Handbook illustrates this advantage—and tells you all about rope of every kind. A free copy is yours for asking.

2355-W

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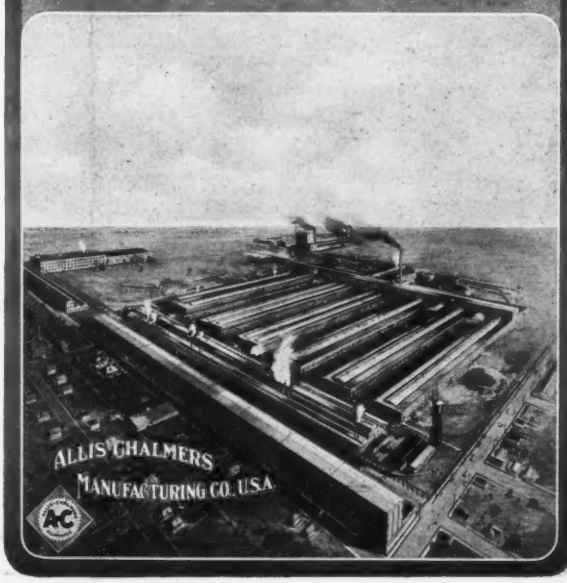

Buyers' Guide of the Rock Products Industry

AIR COMPRESSORS
Worthington Pump & Mach. Co., New York City.

BAGS AND BAG MACHINERY
Bates Valve Bag Co., Chicago, Ill.
Jaite Company, The, Jaite, Ohio.
Valve Bag Co. of America, Toledo, Ohio.

BELTING
Allied Belting Co., The, Greenville, Ohio.
Cincinnati Rubber Mfg. Co., Cincinnati, Ohio.
Goodyear Tire & Rubber Co., Akron, O.
Hettrick Mfg. Co., Toledo, Ohio.
Main Belting Co., Philadelphia, Pa.
New York Belting & Packing Co., New York City.
U. S. Rubber Co., New York City.

BELT FASTENERS
Crescent Belt Fastener Co., New York City.

BELT LACING
Crescent Belt Fastener Co., New York City.

BELT RIVETS
Crescent Belt Fastener Co., New York City.

BIN GATES
Beaumont Mfg. Co., Philadelphia, Pa.

BINS, STORAGE
Preston Co., J. M., Lansing, Mich.
Weller Mfg. Co., Chicago, Ill.

BLASTING SUPPLIES
Aetna Explosives Co., N. Y. City
Atlas Powder Co., Philadelphia, Pa.
Du Pont de Nemours & Co., E. I., Wilmington Del.
Grasselli Chemical Co., Cleveland, Ohio.

BUCKETS, ELEVATOR
Hendrick Mfg. Co., Carbondale, Pa.
Stephens-Adamson Mfg. Co., Aurora, Ill.

BUCKETS
Advance Eng. Co., Cleveland, O.
Browning Co., Cleveland, Ohio.
Marion Steam Shovel Co., Marion, Ohio.
McMyler Interstate Co., Cleveland, Ohio.
Owen Bucket Co., Cleveland, Ohio.

CALCINING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio.
Butterworth & Lowe, Grand Rapids, Mich.

CAR REPLACERS
Track Equipment Co., Huntington, W. Va.

CHAINS AND TRANSMITTING MACHINERY
Link-Belt Co., Chicago, Ill.
Stephens-Adamson Mfg. Co., Aurora, Ill.
U. S. Chain & Forging Co., Pittsburgh, Pa.

CHAINS, DREDGE
U. S. Chain & Forging Co., Pittsburgh, Pa.

CLIPS, WIRE ROPE
American Hoist & Derrick Co., St. Paul, Minn.

CONVEYORS AND ELEVATORS
Caldwell, H. W., & Son Co., Chicago, Ill.
Gifford-Wood Co., Hudson, N. Y.
Good Roads Mach. Co., Philadelphia, Pa.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Link Belt Co., Chicago, Ill.
Portable Machinery Co., Passaic, N. J.
Robins Conveying Belt Co., New York City.
Smith Eng. Works, Milwaukee, Wis.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Sturtevant Mill Co., Boston, Mass.
Universal Road Mach. Co., Kingston, N. Y.
Webster Mfg. Co., Tiffin, Ohio.
Weller Mfg. Co., Chicago, Ill.

CRANES
Locomotive Gantry
American Crane & Eng. Co., Toledo, Ohio.
American Hoist & Derrick Co., St. Paul, Minn.
Advance Eng. Co., Cleveland, O.
Ball Engine Co., Erie, Pa.
Browning Co., Cleveland, Ohio.
Byers Mach. Co., John F., Ravenna, Ohio
Chisholm-Moore Mfg. Co., Cleveland, Ohio.
McMyler-Interstate Co., Cleveland, Ohio.
Link-Belt Co., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, Ohio.
Osgood Co., The, Marion, Ohio.

CRUSHERS AND PULVERIZERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulverizer Co., St. Louis, Mo.
Austin Mfg. Co., Chicago, Ill.
Bacon, Earle C., Inc., New York City.
Beaumont Mfg. Co., Philadelphia, Pa.
Buchanan Co., Inc., C. G., New York City.
Bradley Pulverizer Co., Allentown, Pa.
Butterworth & Lowe, Grand Rapids, Mich.
Chalmers & Williams, Chicago Heights, Ill.
Fuller-Lehigh Co., Fullerton, Pa.
Good Roads Mach. Co., Philadelphia, Pa.
Gruendler Pat. Crusher & Pulv. Co., St. Louis, Mo.
Jeffrey Mfg. Co., The, Columbus, Ohio.
K. B. Pulverizer Co., New York City.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City.
Kent Mill Co., Brooklyn, N. Y.
Lewistown Fdry. & Mach. Co., Lewistown, Pa.
Marathon Mill & Machy. Works, Chicago, Ill.
McLanahan-Stone Mach. Co., Hollidaysburg, Pa.
Pennsylvania Crusher Co., Philadelphia, Pa.
Raymond Bros. Impact Pulverizer Co., Chicago, Ill.
Smidth & Co., F. L., New York City.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Universal Crusher Co., Cedar Rapids, Iowa.
Universal Road Mach. Co., Kingston, N. Y.
Webb City & Carterville F. & M. Works, Webb City, Mo.
Williams Pat. Crush. & Pulv. Co., Chicago, Ill.
Worthington Pump & Mach. Corp., New York City

DERRICKS
American Hoist & Derrick Co., St. Paul, Minn.

DRILLS
American Well Works, Aurora, Ill.
Sanderson Cyclone Drill Co., Orrville, Ohio.
Wood Drill Works, Paterson, N. J.

DRYERS
American Process Co., New York City.
Ruggles-Coles Eng. Co., N. Y. City.
Vulcan Iron Works, Wilkes-Barre, Pa.

DYNAMITE
Aetna Explosives Co., New York City.
Atlas Powder Co., Philadelphia, Pa.
Du Pont de Nemours & Co., E. I., Wilmington Del.

ENGINES, OIL & GAS
Worthington Pump & Mach. Co., New York City.

ENGINES, STEAM
Morris Mach. Works, Baldwinsville, N. Y.

ENGINEERS
Arnold & Weigel, Woodville, Ohio.
Bacon, Earle C., Inc., New York City.
Bradley Pulv. Co., Allentown, Pa.
Buckbee Co., J. C., Chicago, Ill.
Fuller Engineering Co., Allentown, Pa.
R. W. Hunt & Co., Chicago, Ill.
McAuliffe, P. J., N. Y. City
Smidth & Co., F. L., New York City.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Yates, Preston K., New York City.

EXCAVATORS
Ball Engine Co., Erie, Pa.
The Cable Excavator Co., Philadelphia, Pa.
Green, L. P., Chicago, Ill.
Marion Steam Shovel Co., Marion, Ind.
Owen Bucket Co., Cleveland, Ohio.

EXCAVATORS
Dragline Cableway
Sauerman Bros., Chicago, Ill.

EXPLOSIVES
Aetna Explosives Co., New York City.
Atlas Powder Co., Philadelphia, Pa.
DuPont de Nemours & Co., E. I., Wilmington, Del.
Grasselli Chemical Co., Cleveland, Ohio.

FUSES
Ensign-Bickford Co., Simsbury, Conn.

GAS PRODUCERS
Chapman Eng. Co., Mt. Vernon, Ohio.
International Clay Mach. Co., Dayton, Ohio.

GEARS
Caldwell, H. W., & Sons Co., Chicago, Ill.
Stephens-Adamson Mfg. Co., Aurora, Ill.

GLASS SAND EQUIPMENT
Lewistown Fdy. & Mach. Co., Lewistown, Pa.

HOISTS
American Hoist & Derrick Co., St. Paul, Minn.
Chisholm-Moore Mfg. Co., Cleveland, Ohio.
Vulcan Iron Works, Wilkes-Barre, Pa.

HOSE
Water, Steam, Air Drill, Pneumatic Tool
Cincinnati Rubber Mfg. Co., Cincinnati, O.
Goodyear Tire & Rubber Co., Akron, O.
N. Y. Belting & Packing Co., New York City.

HYDRATING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio.
Kritzer Co., The, Chicago, Ill.
Miscampbell, H., Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

HYDRAULIC DREDGES
Morris Machine Works, Baldwinsville, N. Y.

INDUSTRIAL CARS
Atlas Car & Mfg. Co., Cleveland, Ohio.
Easton Car & Constr. Co., Easton, Pa.
International Clay Machine Co., Dayton, Ohio.
Koppel Indust. Car & Equip. Co., Koppel, Pa.
Watt Mining Car Wheel Co., Barnesville, Ohio.

LIME KILNS
Arnold & Weigel, Woodville, Ohio.
Steacy-Schmidt Mfg. Co., York, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

LOADERS AND UNLOADERS
Ball Engine Co., Erie, Pa.
Gifford-Wood Co., Hudson, N. Y.
Good Roads Mach. Co., Philadelphia, Pa.
International Clay Mach. Co., Dayton, O.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Stephens-Adamson Mfg. Co., Aurora, Ill.

LOCOMOTIVES
Baldwin Locomotive Works, The, Philadelphia, Pa.
Fate-Root-Heath Co., Plymouth, Ohio.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Lima Locomotive Works, New York City.
Porter Co., H. K., Pittsburgh, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.
Whitcomb Co., Geo. D., Rochelle, Ill.

MOTORS, ELECTRIC
Gifford-Wood Co., Hudson, N. Y.

MOTOR TRUCKS
Duplex Truck Co., Lansing, Mich.
Pierce-Arrow Motor Car Co., Buffalo, N. Y.

PACKING
Sheet, Piston, Superheat, Hydraulic
Cincinnati Rubber Mfg. Co., Cincinnati, O.
Goodyear Tire & Rubber Co., Akron, O.
N. Y. Belting & Packing Co., New York City.

PAINT AND COATINGS
Williams, C. K., & Co., Easton, Pa.

PERFORATED METALS
Chicago Perforating Co., Chicago, Ill.
Cross Eng. Co., Carbondale, Pa.
Hendrick Mfg. Co., Carbondale, Pa.
Johnston & Chapman Co., Chicago, Ill.
Nortmann Duffke Co., Milwaukee, Wis.

PLASTER MACHINERY
Butterworth & Lowe, Grand Rapids, Mich.
Ehrsam & Sons Co., J. B., Enterprise, Kan.

PORTABLE CONVEYORS
Stephens-Adamson Mfg. Co., Aurora, Ill.

PORTABLE STONE BINS
Austin Mfg. Co., Chicago, Ill.

PUMPS
American Well Works, Aurora, Ill.
Worthington Pump & Machine Co., N. Y. City.

PUMPS, SAND
K. C. Hay Press & Tractor Co., Kansas City, Mo.
Morris Mach. Works, Baldwinsville, N. Y.

POWER TRANSMITTING MACHINERY
Caldwell, H. W., & Son. Co., Chicago, Ill.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Weller Mfg. Co., Chicago, Ill.

POWDER
Aetna Explosives Co., New York City.
Atlas Powder Co., Philadelphia, Pa.
Du Pont de Nemours & Co., E. I., Wilmington Del.
Grasselli Chemical Co., Cleveland, Ohio.

PULVERIZED FUEL EQUIPMENT
Aero Pulv. Co., New York City.
Bradley Pulv. Co., Allentown, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.

QUARRY EQUIPMENT
Beaumont Mfg. Co., Philadelphia, Pa.
Marion Steam Shovel Co., Marion, O.
Universal Road Mach. Co., Kingston, N. Y.

SCRAPERS, DRAG
Green, L. P., Chicago, Ill.
Sauerman Bros., Chicago, Ill.

SCREENS
Austin Mfg. Co., Chicago, Ill.
Beaumont Mfg. Co., Philadelphia, Pa.
Cross Eng. Co., Carbondale, Pa.
Gifford-Wood Co., Hudson, N. Y.
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Johnston & Chapman Co., Chicago, Ill.
Link Belt Co., Chicago, Ill.
National Engineering Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Stimpson Equip. Co., Salt Lake City, Utah.
Sturtevant Mill Co., Boston, Mass.
Universal Road Mach. Co., Kingston, N. Y.

SCREENING
N. J. Wire Cloth Co., Trenton, N. J.

SEPARATORS
National Engineering Co., Chicago, Ill.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.

SEPARATORS, HYDRAULIC
Allen Cone Co., El Paso, Texas.

SEPARATORS, MAGNETIC
Buchanan Co., C. G., Inc., New York City.

SHEAVES
Mayer-Hasseldiek Mfg. Co., St. Louis, Mo.

SHEAVE BLOCKS
Mining Mach. Co., Mountville, Pa.

SHOVELS
Steam and Electric
Ball Engine Co., Erie, Pa.
Bucyrus Company, Milwaukee, Wis.
Marion Steam Shovel Co., Marion, Ohio.
The Osgood Co., Marion, Ohio.
Victor R. Browning & Co., Cleveland, Ohio.

STONE ELEVATORS
Austin Mfg. Co., Chicago, Ill.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Weller Mfg. Co., Chicago, Ill.

TANK CRAWLERS
Victor R. Browning & Co., Cleveland, Ohio.

TRACK EQUIPMENT
Central Switch & Frog Co., Cincinnati, Ohio.
Track Equipment Co., Huntington, W. Va.

VALVES
Goodyear Tire & Rubber Co., Akron, O.

WASHERS, SAND AND GRAVEL
Good Roads Mach. Co., Philadelphia, Pa.
Smith Eng. Works, Milwaukee, Wis.

WIRE ROPE
American Steel & Wire Co., Chicago, Ill.
Leschen, A., & Sons Co., St. Louis, Mo.
Roebling's Sons Co., John A., Trenton, N. J.
Waterbury Co., New York City.

WIRE CLOTH
Cleveland Wire Cloth Co., Cleveland, Ohio.
New Jersey Wire Cloth Co., Trenton, N. J.

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